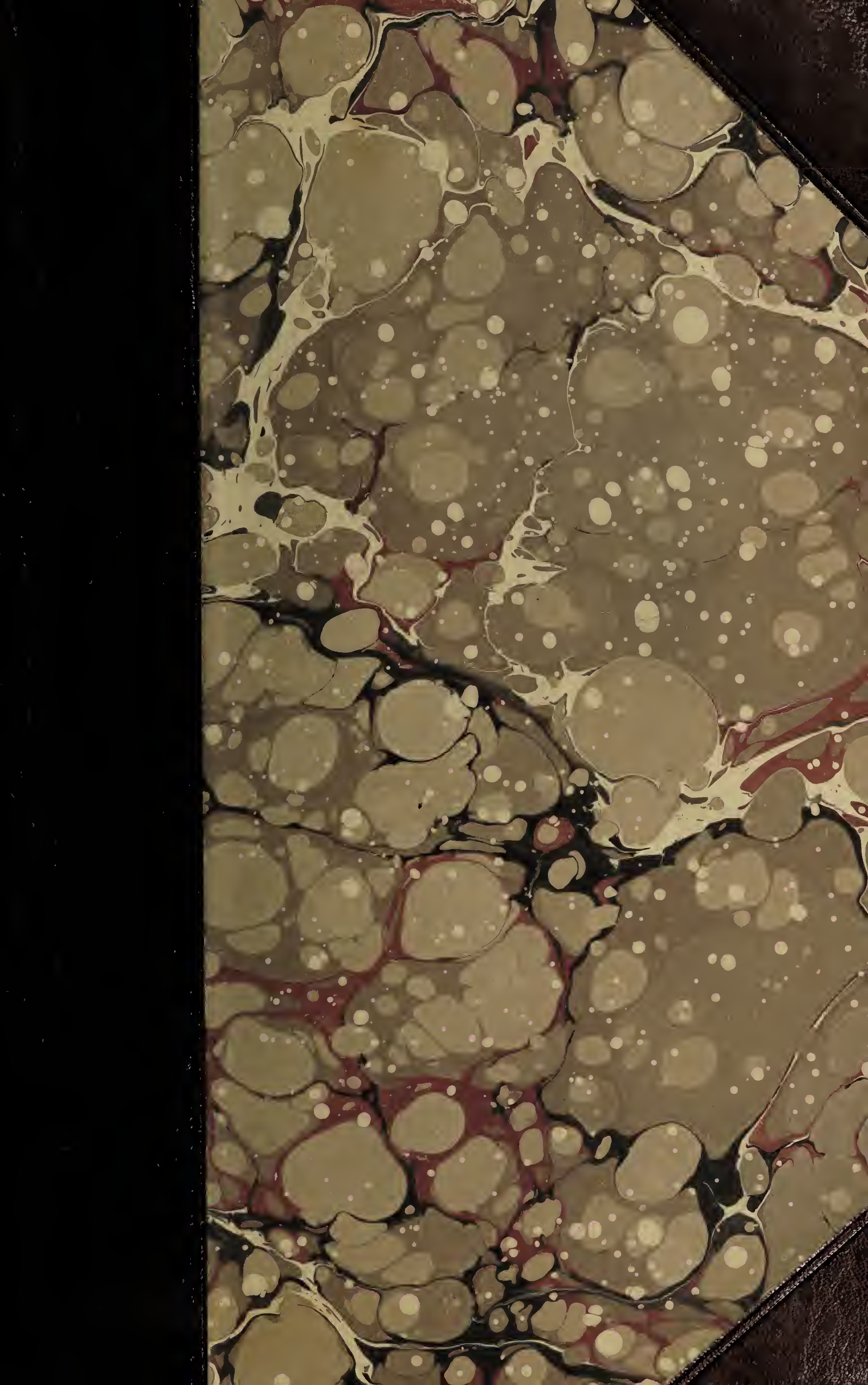

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# OBSERVATIONS
ON THE
# Diſeaſes of the Army,
IN
# CAMP and GARRISON.
In THREE PARTS.

WITH AN
## APPENDIX,
CONTAINING SOME
## PAPERS of EXPERIMENTS,
Read at ſeveral Meetings of the ROYAL SOCIETY.

---

BY
JOHN PRINGLE, M. D. F. R. S.
Phyſician-General to his MAJESTY's Forces employed abroad during the late War.

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# PREFACE.

*THE diſeaſes of the army have, as far as it appears, been treated of by none of the antient phyſicians; nor have we any information from the hiſtorians, unleſs when ſome very uncommon or fatal diſtemper attended an expedition.*

*Thus* Xenophon, *in his relation of the famous retreat of the Greeks, mentions their being liable to the* fames canina, *to a blindneſs, and to a mortification of the extremities, from the ſnow and exceſſive cold they ſuffered on their march.* Pliny, *the naturaliſt, firſt takes notice of the ſcurvy, which afflicted the Roman army, in Germany, after continuing two years in that country*; and we likewiſe find that the Romans have ſometimes been under a neceſſity of removing their camps, on account of the bad air*

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* Antient Germany included the northern parts of the Netherlands, and it is that country PLINY means; for he ſubjoins theſe words, *trans Rhenum, maritimo tractu:* which agrees with the account TACITUS gives of the expedition under GERMANICUS.

*of the adjacent marſhes.* Plutarch *obſerves, that after a famine,* Demetrius *loſt* 8000 *men by a plague* *. Livy *informs us of a like diſtemper, that ſeized both the Romans and Carthaginians in Sicily: and* Diodorus Siculus *deſcribes another plague, attended with a bloody flux, which almoſt utterly deſtroyed the latter, at the ſiege of Syracuſe; and explains the cauſe of it in a full and ſatisfactory manner. But excepting theſe, and a few more inſtances, there remains no account of the diſeaſes incident to the armies of the antients. It may ſeem ſtrange that* Vegetius, *in his book* de re militari, *ſhould write a chapter containing directions how to preſerve the health of ſoldiers, and yet not mention any ſickneſs they were particularly ſubject to; and that he ſhould ſpeak of the phyſicians attending the camp, without taking notice of the manner of diſpoſing of the ſick whether in hoſpitals or otherwiſe.*

*The ſilence of the antients upon this article is the more to be regretted, that as war was their chief ſtudy, it is ſcarce to be doubted, but that the orders relating to the care of the ſick,*

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* Both the Greek and Roman hiſtorians expreſſed every epidemic and mortal diſtemper by a *plague*, whether it was a real plague, or what phyſicians now underſtand by a malignant or peſtilential fever.

*ſick, were no leſs perfect than the other branches of their military ſcience. And whereas their troops were conſtantly employed, and in very different climates, the phyſicians of thoſe days ſeem to have had it greatly in their power to have furniſhed many uſeful obſervations on the variety of camp-diſeaſes, as well as about the method of treating them.*

*Nor has this deficiency, that I know of, been ſupplied by any of the moderns, unleſs by ſuch as either have been little or not at all employed in the ſervice; and who on that account, cannot be ſuppoſed to write better on this head, than that author on the Art of War, who compoſed his treatiſe without ever having ſeen a campaign. So that after all, this ſubject, which ought by this time to have been compleat, is ſtill in a manner new: ſo little is a military life conſiſtent with that ſtate of tranquillity requiſite for ſtudy and obſervation.*

*Upon my firſt being employed in the army, I ſoon perceived what little aſſiſtance I could expect from books; and therefore I began to note down ſuch obſervations as occurred, in hopes of finding them afterwards uſeful in practice. And having continued this method to the end of the war, I have ſince put thoſe materials* *into order, and with as much clearneſs and conciſeneſs as I could, have endeavoured from my own experience to ſupply, in ſome meaſure, what I thought ſo much wanting in this branch of medicine.*

*I have divided the work into three parts. In the firſt, after a ſhort account of the air and endemic diſeaſes of the Low Countries (ſo often the ſeat of our wars) I proceed to give an abridgment of the medical journal, which I had kept of all the campaigns. In this, I mention the epidemics and more frequent diſeaſes of our troops in the order they occurred, the embarkations, encampments, cantonements, quarters, marches, fixed camps, the changes of the weather, and, in a word, all the circumſtances of the army, that I believed might either affect the health, or afford materials to others, to reaſon differently upon. In this part, I have entered little into the deſcription of diſeaſes, much leſs have I touched upon their cure; reſerving both thoſe heads to be conſidered in a ſubſequent part of the work. My chief intention here was to collect materials for tracing the remoter cauſes of military diſtempers, in order, that whatever depended upon thoſe in command, and was conſiſtent with the ſervice, might be fairly ſtated, ſo as to ſuggeſt proper meaſures either for preventing or* *palliating ſuch cauſes. And I have been the more ſtudious of exactneſs in theſe obſervations, as I foreſaw, in whatever manner the whole was to be received, that this part, at leaſt, would be acceptable; as it was chiefly a narration of facts by one who was preſent, and employed all that time. My inferences are few and ſhort, as a full diſcuſſion of thoſe points would have too much interrupted the ſeries of incidents, that were to be preſented at one view.*

*I have, therefore, thrown moſt of the reaſoning reſulting from the firſt part, into the ſecond; in which, after dividing and claſſing the diſeaſes common to a military life, I enquire into the more remote or general cauſes of them; namely, ſuch as depend upon the air, diet, and other circumſtances, uſually comprehended under the head of the* Non-naturals. *And here I have ventured to aſſign ſome ſources of diſeaſes very different from the ſentiments of moſt writers upon this ſubject; and I have alſo ſhewn how little inſtrumental ſome other cauſes are in producing ſickneſs, which yet have been thought, of all, the moſt frequent. Nor will this liberty, I hope, be condemned, when it is conſidered, what greater opportunities I have had beyond others to make ſuch remarks; and that as natural knowledge is daily improving, thoſe au-*

*thors, who write laſt on ſubjects connected therewith, are moſt likely to be in the right.*

*Among the great cauſes of ſickneſs and death in an army, the Reader will little expect that I ſhould mention thoſe very means which are intended for its health and preſervation: I would ſay the hoſpitals, on account of the bad air and other inconveniences attending them. During the late war, one conſiderable ſtep was made for their improvement. Till then, it had been uſual to remove the ſick a great way from the army; whereby many were in a manner loſt before they came under the care of the phyſicians; or, what was attended with equal bad conſequences, if the hoſpitals were nigh, they were for the greater ſecurity to be frequently ſhifted according to the changes of the camp. But the Earl of* STAIR, *my late illuſtrious patron, being ſenſible of this hardſhip, before there was any action in Germany, propoſed to the Duke* de Noailles, *of whoſe humanity he was well aſſured, that the hoſpitals on both ſides ſhould be conſidered as ſanctuaries for the ſick, and mutually protected. This was readily agreed to by the French General, and who, on the firſt occaſion, ſhewed a particular regard to the* cartel. *For, when our hoſpital was at Feckenheim, a village upon the Maine, at a diſtance from the camp, and the Duke* de

Noailles *having occaſion to ſend a party to another village upon the oppoſite bank, apprehending this might alarm the ſick, ſent over to acquaint them, that as he knew the Britiſh hoſpital was there, he meant them no harm, and had given expreſs orders to his troops not to diſturb them. This agreement was ſtrictly obſerved on both ſides all that campaign; and tho' it has been broke through ſince, yet we may hope that in a future war, the contending parties will make it a precedent.*

*After explaining the general cauſes of the ſickneſs, I proceed to point out the means of removing ſome, and rendering others leſs dangerous. Without this addition, the former conſiderations could have been of little uſe. But, it is eaſy to conceive, that the prevention of diſeaſes cannot conſiſt in the uſe of medicine, or depend upon any thing a ſoldier ſhall have in his power to neglect; but upon ſuch orders as ſhall either appear reaſonable to him, or what he muſt neceſſarily obey.*

*I conclude the ſecond part with comparing the numbers of the ſick at different ſeaſons, in order that the Commander may know, nearly, what force he can, at any time, rely upon for ſervice; the effects of ſhort or long campaigns, upon the health; the difference between taking the* *field early, and going late into winter quarters; with other calculations, founded upon ſuch materials as were furniſhed by the late war. The* data *are, perhaps, too few to deduce certain conſequences from; but as I have not found any other I could depend upon, I was obliged to uſe theſe only; which at leaſt will ſerve for a ſpecimen of what may be done in this way, upon farther experience.*

*Hitherto, as I have written for the information of officers as well as phyſicians, I have endeavoured to relate the facts and propoſe my arguments in as plain a manner, and with as few ſcientific terms as was conſiſtent with the nature of the ſubject; and I hope with as much perſpicuity as to be underſtood by any Reader, not unacquainted with the common principles of Natural Knowledge.*

*But the third part, containing the practice, is intended for thoſe of my own profeſſion only; as it neither could be rightly explained, nor prove inſtructive to others. In compoſing this from my notes, I was long in a doubt how to proceed; whether wholly to omit ſuch things as were commonly known, or to treat all the diſeaſes mentioned there in a full and regular manner. But at laſt I determined upon the following courſe.*

*I conceive the diſeaſes, to which an army is moſt ſubject, to be diviſible into two claſſes; one, comprehending thoſe which are alſo common in Britain; and the other, ſuch as are more peculiar to a different climate, or to the condition of a ſoldier. Now, as the firſt have been fully treated of by ſeveral learned authors, in the hands of every phyſician, and occur in daily practice, I curſorily paſs them over; being ſatisfied with laying down my general method of proceeding; the difference, if any, to be obſerved in preſcribing in military hoſpitals; and pointing out thoſe remedies I chiefly relied upon.*

*But, with regard to the other claſs, including the bilious and malignant fevers and the dyſentery, as they are diſeaſes leſs frequent in this country, I thought it proper to handle them more at length; and indeed in ſo full a manner as might inſtruct thoſe who had never ſeen them before.*

*My account of the malignant fever was firſt printed, about two years ſince, under the title of* Obſervations upon the Nature and Cure of the Jail or Hoſpital-Fever: in a Letter to Dr. Mead. *But, as that treatiſe was haſtily publiſhed, upon the jail-diſtemper breaking out* *at that time*, many things were omitted, and miſtakes were made, which I have now endeavoured to ſupply and rectify. Dr.* Huxham's Eſſay on Fevers *came out immediately after; in which I find ſo near a coincidence between his account of the malignant fever, and mine, that I imagine it muſt add no ſmall weight to both our teſtimonies, to find two authors, in different places, without any communication, vary ſo little, in either the cauſe, deſcription, or cure. And from thence we may hope, that, conſidering how fatal this diſtemper has ſometimes been, ſuch information will excite the attention of the publick to the danger ariſing from cloſe and putrid air, ſo common in our jails, ſhips, naval and military hoſpitals; and to the means propoſed of purifying ſuch places by* ventilators.

*To this, as well as to the account of the bilious fevers and dyſentery, I have ſubjoined my conjectures about their more ſubtile and immediate cauſes; tho' I am aware, that an attempt of this kind may rather tend to weaken than to confirm my obſervations: as we but too frequently ſee the judgment influenced and perverted by ſuch kind of theories. But the Reader may be aſſured, that not only the de-*

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* See the account of it in page 346.

*ſcriptions but the cure of all thoſe diſeaſes were long eſtabliſhed, before I thought of aſſigning theſe cauſes; and which, indeed, have been ſometimes firſt ſuggeſted by the effects of the remedies. Yet, the uſe of a theory is evident, from the neceſſity of varying the medicines oftner than can be taught either by mere empiriciſm, or even by analogy from other fevers.*

*I need not acquaint my Reader how little of this reaſoning is my own. The corruption of the humours is hinted at by* Hippocrates, *farther taken notice of by* Galen; *and ſtill more fully and better applied to practice by* Fernelius, Platerus, Eugalenus, Sanctorius, Sennertus, *and other celebrated authors about their time. In a word, how imperfectly theſe principles were then enquired into, they ſeemed to be among the ſureſt of any that were admitted, before the circulation of the blood was known. But ſoon after, both that important diſcovery, and the notion of putrefaction were loſt in the ſyſtems of* Sylvius *and* Willis.

*To theſe laſt ſucceeded the mechanical writers, who detecting the weakneſs of their* hypotheſes, *and believing a few of the mixed mathematical principles adequate to ſolve all* phænomena, *began from thence to explain the nature*

*ture of fevers: either wholly rejecting, or too ſparingly admitting chemiſtry. This error did not eſcape the learned* Boerhaave, *who, tho' he retained the uſe of mechanics, yet revived and reformed the doctrine of* acids *and* alcalies; *and under theſe laſt comprehended all that he thought* ſeptic *or* putrid. *But, as my celebrated Maſter had not time to aſcertain every part of his doctrine from experiments of his own, it was no wonder ſome miſtakes were made, and that the extent of theſe principles were not fully underſtood.*

*Two things induced me to proſecute this ſubject; the great number of putrid caſes, that were under my care in the hoſpitals abroad; and the authority of Lord* Bacon, *who offers many reaſons for conſidering the knowledge of what brings on and retards putrefaction, as moſt likely to account for many of the more abſtruſe operations of nature*. My papers upon this ſubject being read at ſeveral meetings of the Royal Society, were left in the hands of the Secretary; but, finding it neceſſary to make frequent references to thoſe experiments, I thought it proper to annex them to this work, in the ſame order they were preſented; adding only a few notes, to explain what might not*

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* Natural Hiſtory. Cent. iv.

*have been fully or clearly enough expreſſed before; and others, by way of connecting thoſe facts with the preceding Obſervations. If I may direct the Reader in the manner of peruſing the whole, it would be to examine the experiments firſt, or at leaſt previouſly to the third part.*

*I am ſenſible, notwithſtanding all my care and attention in making both the Obſervations and Experiments, that not only many inaccuracies, but miſtakes muſt have eſcaped me; which, thoſe will moſt readily excuſe, who having themſelves made reſearches of this kind, are not unacquainted with the difficulties attending them. Yet, however imperfect theſe ſheets may be, I may hope they will ſerve as a foundation for others to go upon; who, by making improvements on this ſubject, will concur with me, in attempting to draw from the calamities of war ſomething that may be uſeful to the public.*

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# OBSERVATIONS

## On the DISEASES of the ARMY in CAMP and GARRISON.

## PART I.

### CHAP. I.

### *Of the* AIR *and* ENDEMIC DISEASES *of the* LOW COUNTRIES.

THE river Lis, riſing in Artois, and joining the Scheld, at Ghent, divides the high and dry part of Flanders from the low and wet. Between this line and the ſea the country is flat, marſhy and unhealthful, including Dutch Flanders, with ſome barrier towns belonging to the States, the French, and Auſtrians: of all which, Furnes and Sluys are the moſt ſickly. But the remaining part of Flanders is higher, and, with the reſt of the Auſtrian Netherlands, is altogether a dry and healthful country.

Great part of the United Provinces is likewiſe low and wet, and ſubject to the ſame diſtempers with Flanders: and Dutch Brabant being alſo marſhy, from Graaf downwards along the Maes, and every where incommoded with water near the ſurface, is ſubject to the ſame aquatic diſeaſes. But above all, Zealand ſhares the worſt air; as being not only low and watery, but ſurrounded with the oozy and ſlimy beaches of the eaſtern and weſtern Scheld, and the moſt marſhy parts of the country: ſo that almoſt every wind, except from the ocean, muſt add to its native moiſt and unwholeſome exhalations.

All this tract of the Netherlands being little higher than the level of the ſea, or the rivers that paſs through it, was once ſo much expoſed to inundations from floods and high tides, that till dykes and drains were made, it was no better than a large moraſs; and even now, after incredible labour, the country is ſtill ſubject to be overflowed by extraordinary floods, and other caſual inlets of water. By the evaporation of this, as likewiſe of the canals and ditches, in all which innumerable plants and inſects lie and rot, the atmoſphere is filled, during the latter part of ſummer and autumn, with moiſt, putrid, and inſalutary vapours.

A ſecond, but leſs obvious ſource of humidity, is from the water under ground; which is every where ſo near the ſurface, that a conſtantly dry ditch, the ſure mark of a healthful ſituation, is never ſeen, except in the higher lands. Now as the ſoil is light, the moiſture eaſily tranſpires, and in ſummer loads the air with vapour, even where no water is viſible. This is the condition of moſt of Dutch Brabant; the inhabitants of which are leſs liable to intermittents, in proportion to the depth of this ſubterraneous water; ſo that by looking into the wells, it is eaſy to determine the comparative health of each village. Theſe wells being fed by the under-ground water, and ſinking proportionally to the droughts of ſummer, are at once a proof and meaſure of the conſtant exhalation of this water by the ſun.

In Zealand, and upon the oppoſite coaſt of Flanders and Brabant, is obſerved a peculiar kind of putrid damp, which riſes at low water from a beach covered with ſlime and mud, more liable to corruption on account of the mixture of freſh and ſalt water [*]. But upon an open and ſandy coaſt, as at Oſtend, the country is refreſhed with wholeſome winds from the ſea; while at the ſame time there is reaſon to believe the exhalations from thence are conſiderably leſs than thoſe of the marſhy grounds [†], and never putrid.

But another and more general cauſe of the humidity and corruption of the atmoſphere, is from an imperfect ventilation. There are no hills to receive the winds, or to direct them in ſtreams upon the lower grounds; hence the air is ſo apt to ſtagnate; and the more by reaſon of large plantations made for pleaſure, incloſures, or fuel. The farms and ſmaller villages are crowded with trees, which not only confine but moiſten the air, by tranſpiration. But in towns, where there is leſs of this kind of moiſture, where the houſes and pavements of the ſtreets in a great meaſure prevent the riſing of the damps, and where there are continual fires, the aquatic diſeaſes are both fewer and milder.

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[*] Vid. Lancis: *de Nox. Palud. Effluv. lib.* i. p. i. c. v.

[†] *Hiſt. de l'Acad. R. des Sc.* A. 1741. p. 27.

To theſe cauſes of endemics in flat and marſhy countries muſt be added, the impurity of the common water, which being here either collected from rains, and preſerved in ciſterns, or drawn from wells extremely ſhallow, is, in hot and dry ſeaſons, ſoon corrupted. This being the caſe, the general tendency to putrefaction is aggravated by the uſe of ſuch water; as well as by meats, which in a cloſe, hot, and moiſt air, are quickly tainted. Every thing, therefore, conſpires in ſummer, not only to relax the ſolids, but to diſpoſe the humours to putrefaction: and as the combination of heat and moiſture is the univerſal cauſe of a ſpeedy corruption of all animal ſubſtances, ſo it is obſerved, in every country, to produce fevers, and other diſtempers of a putrid kind; exactly the ſame, or ſimilar to what occur in the low and marſhy parts of the Netherlands.

This is the nature of the climate: but according to the various degrees of heat, and moiſture of the ſeaſon, the epidemics will begin earlier or later, be of longer or ſhorter duration, and will be attended with milder or more alarming ſymptoms. If the heats begin ſoon, and continue throughout autumn, not moderated with winds and rains, the ſeaſon proves extremely ſickly, the diſtempers appear ſoon, and are dangerous: but if the ſummer heats begin late, or are tempered with frequent ſhowers and winds, or if the autumnal colds begin early, then are the diſeaſes both late and few, the ſymptoms gentle, and the cure eaſy *.

And here it will be proper to obſerve, that moiſt and rainy ſeaſons differ greatly; ſince in marſhy countries, intenſe and continued heats occaſion a moiſture in the atmoſphere, by the immenſe exhalation they raiſe; whereas frequent ſhowers during the hot ſeaſon, cool the air, check the exceſs of vapour, dilute and refreſh the corrupted ſtagnating water, and precipitate all putrid and noxious *Effluvia*.

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* All this is agreeable to a regiſter of the weather and diſeaſes kept for ſeveral years, by Dr. Stocke, phyſician at Middelburg.

But if heavy rains in the beginning of ſummer are ſucceeded by great and uninterrupted heats, theſe rains, by overflowing the meadows, ſerve only for matter of more exhalation, make the ſeaſon more ſickly, and the diſtempers more fatal.

Again, it is to be remarked, that the ſickneſs never begins till the heats have continued ſo long as to give time for the putrefaction and evaporation of the water. The commencement, therefore, of the epidemics may be dated from ſome time in July, or the beginning of Auguſt, under the canicular heats; their ſenſible decline about the firſt falling of the leaf, and end when the froſts begin. For the reſt of the year it is ſafe, and not peculiarly diſpoſed to produce any diſtemper.

It is farther to be obſerved, that tho' in the month of September the greateſt ardour of the ſeaſon is gone, yet the epidemics continue, by reaſon of the difference of the degree of heat between the days and nights. The days are ſtill warm, but the nights are cold and often foggy; and it is by theſe ſudden tranſitions that the perſpiration is ſtopped, and the more putreſcent parts of the blood retained, or thrown in the form of a putrid and acrid bile upon the bowels. It muſt alſo be remarked, that the ſummers are hotter, and the weather more conſtant, on the continent, than in the ſame latitude in Britain: and laſtly, that in the Netherlands the heats are more cloſe and ſtifling than they are uſually felt in hilly countries.

The epidemic of the hot ſeaſon, and great endemic of this and other marſhy countries, is a fever of an intermitting nature, commonly of a tertian ſhape, but of a bad kind; which, in the damper places and worſt ſeaſons, appears in the form of a double tertian, remittent, continued putrid, or even an ardent fever *. All which, however varying in type in different conſtitutions and other circumſtances, are nevertheleſs of the ſame nature, and proceed from like cauſes: as a proof, both the continued and ardent fever of that ſeaſon, uſually terminate in regular intermittents.

In Zealand, where the air is worſt, it is called the gall-ſickneſs; and, indeed, both the ſurcharge and depravation of the bile is ſo re-

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* An ardent fever is defined Part III. Ch. iv. § 2.

markable, wherever theſe fevers prevail, that the immediate cauſe has been uſually referred to the corruption of that humour. But however that be, it is certain, that the continuance and malignity of the diſeaſe is owing in a great meaſure to an increaſed ſecretion, and putrefaction of the bile, occaſioned by the fever.

In proportion to the coolneſs of the ſeaſon, to the height and drineſs of the grounds, the epidemic appears milder, remits or intermits more freely, and recedes farther from the nature of a double tertian, a continued putrid, or an ardent fever. In its worſt ſtate, the effects plainly aſcertain the cauſe; as theſe fevers are attended with intenſe thirſt and heat, foulneſs of the tongue, bitterneſs of taſte, deſire of acids, nauſea and averſion to all animal food, putrid vomiting, extreme ſenſe of oppreſſion about the ſtomach, livid ſpots, and the like ſtrong indications of a putrid bile; if not a corruption of all the humours. And whereas, with ſuch ſymptoms, the diſeaſe aſſumes an intermitting or remitting form, it ſhould ſeem, that even the more benign intermittents of this ſeaſon were owing to a leſſer degree of the ſame cauſe.

The *Cholera Morbus*, and dyſentery, tho' rarely to be called epidemic, are nevertheleſs frequent diſeaſes of theſe moiſt countries. They appear in the ſame ſeaſon with the fevers, and ſeem to be only particular determinations of the ſame corrupted humours; to which, if the firſt paſſages give free vent, a *Cholera* or flux enſues; but if the vitiated humours are retained and aſſumed into the blood, they may occaſion an intermitting, remitting or continued fever.

Both fevers and fluxes are often accompanied with worms, which are not to be deemed the cauſe of either; but only a ſign of a preceding bad ſtate of the bowels, brought on by a decay of the natural ſecretions, a ſtagnation and corruption of aliment, and a weakened tone of the inteſtines; all owing to the heats and moiſture of the ſeaſon.

Theſe are the acute endemics of the marſhy parts of the Netherlands. The chief chronical diſtemper is a ſpecies of a ſcurvy peculiar to a moiſt and corrupted air; the ſymptoms of which agreeing ſo much with the ſea-ſcurvy, they may be accounted the ſame diſeaſe. The exhalation of the canals and marſhes in hot weather, act like the vapour which riſes from the bildge-water of a ſhip; both are moiſt and putrid; and in both the effects of putrefaction are plainly ſeen. Here the ſea air is leaſt to be blamed; for ventilation on board a ſhip is no greater preſervative from the marine ſcurvy, than removing from the marſhes to a dry ſea coaſt, or to any other dry and ſound air, is a cure for the other.

In general, it is the richer ſort, or thoſe who can afford to live above the common rate, who keep freeſt from the diſeaſes of the marſhes. For ſuch climates require dry houſes, the apartments raiſed from the ground, proper exerciſe, without labour in the ſun or in the evening damps, a juſt quantity of vinous liquors, and victuals of good nouriſhment: without ſuch helps, not only ſtrangers, but the natives themſelves are extremely ſubject to diſeaſes, after hot and cloſe ſummers. The hardieſt conſtitutions are not more exempted than others, and leſs in proportion to the drineſs of the parts from whence they come. And this is the reaſon Britiſh ſoldiers are ſo liable to bilious fevers and fluxes, in the wetter parts of the Netherlands.

Now tho' in the lower parts of Flanders and Holland, the ſummer and autumnal diſtempers appear in the extreme, yet in no country, however dry, is there a total exemption. For the ſummer heats, if great, always relax the ſolids, and tend to corrupt the juices: under which circumſtances, if the body is expoſed to fogs and nocturnal damps, or receives improper food, the ſame kind of diſtempers, tho' leſs characterized, and in ſmaller numbers, will be incident to dry as well as marſhy countries. Hence in the drieſt camps, after great and continued heats, theſe ſummer and autumnal fevers and fluxes are conſtant; becauſe in that ſituation, beſides the natural moiſture of a tent, men muſt either by duty or miſconduct be frequently expoſed to wet ground, wet cloaths, nocturnal damps and colds. And the ſubjection to theſe maladies is the more inevitable, in proportion to the more ſenſible and frequent interchanges of heat and cold in the field, than in quarters.

But a ſudden ſtoppage of perſpiration coming upon relaxed fibres, and a putreſcent ſtate of blood, if not timely remedied, is ſure to produce a remitting fever, dyſentery, or the like diſorder: ſo that theſe diſtempers may be called as properly the endemics of a camp, as of a low and marſhy country.

## CHAP. II.

## *A general account of the* Garrison Diseases *of the Britiſh troops in Flanders, and the cantonments in Germany.*

IN the beginning of June (*N.S.) 1742, the Britiſh troops began to embark for Flanders. There were in all, of foot and cavalry, about 16,000; the winds were favourable, the ſeveral embarkations ſhort, the men landed in good health, and went into their ſeveral garriſons.

The head-quarters were at Ghent, with moſt of the cavalry, three battalions of guards,

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* N. B. The new ſtile is uſed throughout.

1742. one marching regiment, and the train; eight battalions were quartered at Bruges, two at Courtray; a regiment of dragoons lay at Oudenarde, and another was divided between Aloſt and Grammond. At Ghent there was a general hoſpital; but in the other garriſons the care of the ſick was committed to the ſurgeons of their reſpective regiments.

During the ſummer and autumn, the weather was good, the heats moderate, and the country, for the ſeaſon and climate, enjoyed good health. The Britiſh officers ſhared in it, but the common men were generally unhealthy; and this ſeemed to be the reaſon:

Ghent is ſituated between the high and low part of Flanders; one quarter of it, called St. Peter's hill, ſtands high above the reſt of the country, and in this the barracks, having drains and free air, were quite dry; ſo that the men who lay there enjoyed perfect health: but the reſt who were quartered in the low part of the town, whoſe barracks being moſtly the ground-floors of waſte houſes, without drains, and, of courſe, very damp, were all ſickly. The battalion of the firſt regiment of guards was a remarkable inſtance of

1742.

of the difference of quarters: two of its companies lay on St. Peter's hill, the remaining eight in the loweſt part of the town, in rooms ſo very damp, that the men could ſcarce keep their ſhoes and belts from moulding. In the month of July, the ſick of one battalion amounted to about 140 *; of which number only two belonged to the companies on the hill, and all the reſt to thoſe in the lower town. But in the middle of Auguſt, upon changing the barracks, the ſickneſs ſuddenly abated. The reſt of the garriſon ſuffered much leſs in proportion; the higheſt Returns of the foot at no time exceeding 70 in a battalion, and 40 in a regiment of dragoons †. Now as the Returns include all accidents unfitting a ſoldier for duty, and as theſe numbers are little more than triple to what ſuch corps would commonly have at home, the ſickneſs in this garriſon was accounted moderate. The higheſt Returns were in the month of Auguſt; when the diſtem-

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* A compleat battalion conſiſted of 813; but as commiſſioned officers are not put in the Returns of the ſick, we are only to reckon the full corps at 780.

† This conſiſted of three ſquadrons, and each ſquadron of 158 men, not including officers.

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1742. pers were chiefly intermitting and remitting fevers, diarrhœas, and a few dyſenteries.

But the ſickneſs was more conſiderable at Bruges, a city of the lower diviſion of Flanders, and moiſter than Ghent. The ſoldiers had moreover damper barracks, and ſuffered accordingly. The remitting and intermitting fevers began in July; in Auguſt the intermittents were moſt numerous, which continuing throughout September, diminiſhed in October, and ceaſed with the froſts in November. Theſe fevers were not only of a worſe kind than thoſe at Ghent, but the Returns of the ſick were three times greater, and more in proportion died. Next to the fever, fluxes were moſt frequent; and tho' not always with blood, were generally of the dyſenteric kind. It was then obſervable, that ſuch as lay in the upper ſtories, kept their health incomparably better than thoſe who were below on the ground floors.

The two battalions at Courtray happened to be differently lodged; one had dry barracks, the other wet, and theſe laſt had double the number of ſick throughout the autumn: but the higheſt Return did not exceed 70.

Oudenarde is in the higher diviſion of 1742. Flanders; but the barracks being without drains, and damp, and the ſituation low, the Welch Fuzileers, who lay there, ſuffered as much in proportion as the garriſon of Bruges.

But at Aloſt and Grammont, towns in the ſame diviſion (where the dragoons were billetted in private houſes) there was ſcarce any diſtemper at all; and that corps was in ſuch health, when the army marched into Germany, that it left not a man behind.

The great number of ſick, and the little experience in the cure of diſeaſes incident to a moiſt climate, were the reaſons that, at this time, the fevers were perhaps leſs ſucceſsfully treated than afterwards. Many of the remittents degenerated into continued fevers, often mortal; and the intermittents, or agues, by being prematurely ſtopped, or not ſecured againſt relapſes, changed likewiſe into continued fevers, or ended in dangerous obſtructions of the *viſcera*.

After the froſts in November, the intermittents never appeared, unleſs upon catching cold; when ſuch as had been ill in autumn were ſubject to relapſe.

1742. Here the autumnal epidemic ceaſed, and the winter diſeaſes began; which were colds in various ſhapes. The moſt common were hard coughs, ſtitches, rheumatic pains, pleuriſies, inflammations of the lungs, &c. to all which the ſoldiers, unuſed to duty and cold quarters, and unprovided with cloaths ſuited to the climate, and to the ſeaſon (at this time particularly ſharp) were extremely liable.

Beſides theſe, there was no general ailment, except the itch; which indeed was ſo univerſal, ſoon after landing, that many believed, that either the ſalt proviſions at ſea, or the change of air, muſt have been the cauſe of ſo ſudden and extenſive a complaint. But, it was ſolely owing to the contagion of a few, who being infected before the embarkation, communicated the diſtemper to their companions on board, or ſoon afterwards in the barracks.

Such were the diſeaſes moſt incident to the troops, before they marched. The leſs frequent, were dropſies and conſumptions; whereof the former were the conſequence of the autumnal fevers ill cured; and the latter, the termination of neglected colds.

But of all, the moſt alarming was a fever of a malignant nature, very ſlow, and attended with a ſunk pulſe and a conſtant *Stupor:* yet it was more the newneſs and danger, than the number ſeized, that made it conſiderable. The cauſe was at firſt miſtaken; but afterwards, it appeared to ariſe from the foul air of ſome of the wards crouded with ſick; and eſpecially of one room, in which a man lay with a mortified limb. This fever was confined to the hoſpital; and as it has generally taken its riſe from thence, it ſhall hereafter be diſtinguiſhed by the name of the *malignant* or *hoſpital fever*. 1742.

In the beginning of February, the troops moved from winter quarters, and marching into Germany, were cantoned in the country of Juliers and Aix-la-Chapelle. Part of the cavalry, only, was left at Bruſſels; and the ſick and weak, to the amount of 600, being collected from all the garriſons, were put into the general hoſpital at Ghent. The weather was, for the ſeaſon, favourable, and the troops entered Germany in good condition. Soon after, the *Influenza* paſſed through the greateſt part of Europe, and was ſenſibly felt 1743.

1743. at Bruſſels; tho' but little in the cantonements; otherwiſe, than that many, who, in the preceding autumn had been ſeized with agues, then relapſed. For other diſeaſes, they were the ſame as in garriſon; ſuch as coughs, pleuriſies and the like, from taking cold in a rigorous ſeaſon.

From the arrival of the troops at their cantonements, till the beginning of May, the weather was extremely cold, with extraordinary ſnows; which fell towards the end of March, and continued for ſeventeen days: in the midſt of which the troops left their quarters, and croſſed the Rhine. The march was long, and the roads deep; but as the men came every night into warm houſes, and had good proviſions, ſo few fell ill by the way, that in both marches, from Ghent to the cantonements, and from thence to the place of encampment, in winter, or in the worſt weather, we did not, in all, loſe twenty. In the beginning of May, the weather ſuddenly changed, and the troops encamped on the 17th, at Hoechſt, on the banks of the Maine, in a dry, open and healthful country.

## CHAP. III.

### *A general account of the* DISEASES *of the Britiſh troops, during the campaign in Germany, and the enſuing winter in Flanders.*

THE ground, tho' naturally good, had not had time to dry thoroughly ſince the late ſnows and rains; and tho' the days were now warm, the nights were ſtill cold, and condenſed the vapours. Theſe ſudden interchanges of heat and cold, joined to the moiſture inſeparable from tents, could not but affect the health of troops unuſed to the field. Many were threreupon ſeized with inflammatory diſorders, of ſundry forms.

The flying hoſpital was opened at Nied, a village in the neighbourhood of the camp, which, in three weeks, admitted about 250 ſick. When the number was thirty leſs, the diſtempers were claſſed, and ſtood thus: of pleuriſes and peripneumonies, 71; rheumatic pains, with more or leſs of fever, 51; inflammatory fevers, without either rheumatic, or pleuritic pains, 25; intermittents, 30;

1743. hard coughs without fever, 9; old coughs and conſumptions, 7. The reſt had either fluxes, or ſome inflammatory ſymptom different from theſe mentioned; and ſeveral ſlighter caſes remained in the camp. The intermittents and fluxes were alſo accompanied with a conſiderable degree of inflammation.

This, with a little variation, is the courſe of the firſt camp-diſeaſes; for the nights being yet cold, and the ground wet, it is eaſily conceived in what manner men muſt ſuffer, who lie in tents, without any covering. Beſides, ſoldiers are frequently expoſed to rain, and have not means of drying their cloaths; at other times, for want of occupation, they are apt to lie down on the graſs, and fall aſleep in the ſun.

Hence, the diſeaſes from the firſt encampment till paſt the ſummer ſolſtice, are all highly inflammatory. Fluxes, remitting and intermitting fevers are, during this period, never general; and ſuch as occur, are never without inflammation.

The cavalry had not near their proportion of ſick, and never have in camps; for the care of the horſes gives the men an eaſy but conſtant employment, their cloaks keep them dry in rains, and ſerve for bed-cloaths at night. For the officers, they enjoyed then perfect health, and always do in the firſt part of a campaign.

On the 22d of June, the army marched to Aſchaffenburg, where it encamped on a dry and airy field. In the hoſpital were left 500; ſo that in five weeks the proportion of the ſick to the whole, was about 1 to 29. Before this motion of the troops, the ſickneſs had ſenſibly decreaſed; and it continued ſtill to decline in the new camp: for, the weakeſt were already in the hoſpital, and the reſt of the men were inured to the field. Add to this, that the nights were now warm, and that there had been no rain to wet the men's cloaths, or the ground on which they lay.

On the 26th, in the evening, the tents were ſtruck; the army marched all night, and next morning fought at Dettingen. On the night following, the men lay on the field of battle, without tents, expoſed to a heavy rain; and next day marched to Hanau, where they encamped in an open field, and on good

1743. ground, but then wet; and they had no ſtraw for the firſt night. By theſe accidents, a ſudden change was made in the health of the army. For, the ſummer had begun early, and the heats hitherto had been great and conſtant; but, the free and uninterrupted perſpiration, attending thoſe very heats, had as yet prevented them from producing any general ſickneſs. Now the pores were ſuddenly ſtopped, the humours became putrid, and in that condition were turned upon the bowels, occaſioning an epidemic dyſentery; which began at this time, and continued for a great part of the ſeaſon. In the ſpace of eight days after the battle, about 500 were ſeized with it; and in a few weeks more, near half of the troops were either ill, or had recovered of that diſtemper. It was common, tho' not nearly ſo frequent, among the officers; of whom thoſe were firſt ſeized, who happened to lie wet at Dettingen: the reſt ſuffered by contagion.

The dyſentery, the conſtant and fatal epidemic of camps, appeared ſooner this ſeaſon than it did in any ſucceeding campaign. Now, as its uſual time is not before the latter end of ſummer, or beginning of autumn, its cauſe has been unjuſtly imputed 1743. to eating fruit in exceſs. But, the circumſtances here contradict that opinion; for the ſickneſs began and raged before any fruit was in ſeaſon, except ſtrawberries, (which, from the high price, the men never taſted) and ended about the time the grapes were ripe; which growing in open vineyards were eat by every body.

To this we may add the following incident. Three companies of Howard's regiment, which had not joined the army, marched with the King's baggage from Oſtend to Hanau; where arriving a night or two before the battle, and having orders to ſtop, encamped for the firſt time, at a ſmall diſtance from the ground, that was afterwards occupied by the army. Theſe men had never been expoſed to rain, or lain wet; by this ſeparation from the line, they were alſo removed from the contagion of the privies; and having pitched cloſe upon the river, they had the benefit of a conſtant ſtream of air. By means of ſuch favourable circumſtances, it was remarkable, that while the army ſuffered moſt, this little camp entirely eſcaped the diſtemper; tho' the

1743. tho' the men breathed the ſame air, the contagious part excepted, eat of the ſame victuals, and drank of the ſame water. This immunity continued for ſix weeks, until the army removed from Hanau; when theſe companies joining the main body, and encamping in the line, were at laſt infected; but ſuffered little, as the flux was then ſo much upon the decline.

The dyſentery raged all the month of July and part of Auguſt, to which the weather contributed. For, ſoon after the above mentioned rains, which had cooled the air, the heats returned, and continued for ſome weeks ſo great, that the humours, already too much diſpoſed, were farther prepared to receive the infection. Of this the chief *fomes* ſeemed to be the foul ſtraw and the privies: for, as ſoon as we left that ground, the ſickneſs viſibly abated.

The numbers aggravated the ſymptoms, as in the caſe of the ſmall pox, plague, and every other putrid and infectious diſeaſe. But, the flux is particularly deſtructive in full hoſpitals, where the corrupted ſteams being confined and accumulated, are raiſed to a high degree of virulence: of which fact the preſent ſickneſs afforded a fatal inſtance. 1743.

The village of Feckenheim, about a league from the camp, was taken up for an hoſpital; into which, during the ſtay the army made at Hanau (beſides the wounded from the field of battle) about 1500 ſick were ſent from the camp; and of that number, the greateſt part, ill of the dyſentery. By which means the air became vitiated to ſuch a degree, that not only the reſt of the patients were ſeized with the flux, but the apothecaries, nurſes, and other attendants, with moſt of the inhabitants of the village, were alſo infected. To this acceded a ſtill more formidable diſeaſe, namely, the *hoſpital* or *jail-fever*, an inſeparable attendant of foul air from crowds and animal corruption. Theſe two combined occaſioned a great mortality: while on the other hand, ſuch as were ſeized with the dyſentery, and not removed from the camp, tho' wanting many conveniencies, others had in hoſpitals, kept free of the malignant fever, and commonly did well.

On the 10th of Auguſt, the army decamped from Hanau, and came to Wiſbaden; where

1743. we lay ſome days, and were joined by four battalions from England. On the 23d, we croſſed the Rhine, and on the 30th of the ſame month, encamped at Worms, along the river; where we continued until the 25th of September. All the encampments were on dry ground, and in an open country.

The month of Auguſt was ſtill warm and dry, without fogs; and the reſt of the autumn was of a piece, allowing for the abatement of heat, and the conſtant dews of this ſeaſon. In the end of Auguſt, tho' the days were ſtill hot, the nights grew cool; and in the beginning of October the cold was ſo far advanced, that the fields were ſometimes covered with a hoar-froſt.

From the time of removing from Hanau, there was ſo remarkable a decline of the dyſentery, that the change could be only imputed to the leaving behind the infectious privies, the foul ſtraw, and filth of a long encampment. When the army croſſed the Rhine, this diſtemper made but a third of all the ſickneſs, from having been lately almoſt the only complaint. In a month after it was ſcarce ſeen, unleſs in a few; who by reaſon of imperfect cures, colds, or errors of diet, chanced ro relapſe. 1743.

About the middle of Auguſt, when the dyſentery was on the decline, a new diſeaſe appeared, and which daily increaſed, as long as the troops kept the field. This was a remitting fever; the paroxyſms of which came on the in the evenings, with great heat, drought, a violent head-ach, and often a *delirium*; all which ſymptoms laſted moſt of the night, but abated in the morning with an imperfect ſweat; and ſometimes with an hæmorrhage of the noſe, or a looſeneſs. The ſtomach was, from the beginning, much diſordered with a *nauſea* and ſenſe of oppreſſion, frequently with a bilious and putrid vomiting. If evacuations were either neglected, or too ſparingly uſed, the patient fell into a continued fever; and ſometimes grew yellow, as in a jaundice. When the ſeaſon was far advanced, ſo that colds became frequent, the fever was attended with a cough, rheumatic pains, and ſizy blood. The officers were not ſo ſubject to it as the common men, being leſs expoſed; and for the like reaſon the cavalry, who had cloaks to keep them warm a-nights, were leſs liable

1743. to fall ill. Others, who belonged to the army, but lay in quarters, were yet ſeldomer ſeized; and the leſs in proportion to their being little expoſed to heats, night-damps, and bad lodgings. This diſtemper, another conſtant epidemic of an army, ſhall hereafter be diſtinguiſhed by the name of the *bilious*, or autumnal *remitting fever*.

In the courſe of the dyſentery, and even of this fever, ſeveral voided round worms; and the ſame ſymptom has occurred in both, in every campaign. But we are not, therefore, to imagine, that theſe worms are the cauſe of the fever or flux; but only, that when joined to either, they make them worſe.

On the 25th of September, the army, free of the dyſentery, but with a daily increaſe of the remitting fever, marched to Spiers; but returned on the 13th of October. The weather had changed, and it rained much during the march; which, with the coldneſs of the ſeaſon, cauſed, in that little time, ſo much ſickneſs, that when the troops came back, above 800 more were ſent into the hoſpital, and almoſt all of them ill of this fever. Three days after, the army moved to Biberic, and breaking up camp, on the 25th of October, the Britiſh, in different diviſions, returned to the Netherlands. The weather was extremely favourable to the march (which continued a month), and the men coming into warm quarters every night, ſo few fell ill, that they arrived at their ſeveral garriſons with ſcarce the loſs of a man. 1743.

But 3000 ſick were left in Germany; part at Feckenheim, near Hanau; and the reſt at Oſthoven and Bechtheim, two villages in the neighbourhood of Worms. The ſtate of the ſick at Feckenheim has been mentioned; where the malignant fever and dyſentery grew daily worſe. Few eſcaped; for, how mild or bad ſoever the flux was, (for which the perſon was ſent to the hoſpital) this fever almoſt ſurely ſupervened. The petechial ſpots, blotches, parotids, frequent mortifications, contagiouſneſs, and the great mortality ſet forth its peſtilential nature. In this reſpect it was worſe than the true plague, that there was no ſecurity againſt a relapſe; but on the contrary, almoſt a certainty of it, if the perſon continued in the infectious air. Of fourteen mates employed about the ſick, five died; and, excepting one or two, all

1743. the reſt had been ill, and in danger. The hoſpital loſt near half of the patients; but the inhabitants of the village having firſt received the flux, and afterwards the fever by contagion, between the two were almoſt utterly deſtroyed.

The condition of the two hoſpitals near Worms was better; there the ſick had more ſpace, they had been admitted in a cooler ſeaſon, and the diſtempers were leſs putrid. But, one general hoſpital being to be made at Newied, the ſick were removed from their ſeveral quarters, and carried down the Rhine to that place: where, by the change of air, thoſe from Feckenheim were at firſt relieved, but the reſt, who were mixed with them, caught the infection; which the following circumſtance rendered ſtill more general and fatal. For, orders coming ſoon after to remove the hoſpital from Germany to Flanders, all the ſick were embarked in bilanders, and conveyed by water to Ghent; but where they did not arrive till about the middle of December. So that, in this tedious voyage, the fever having acquired new force by the confinement of the air, mortifications, and other putrid *Effluvia*, it was raiſed to ſuch an extraordinary pitch of virulence, that above half the number died by the way, and ſeveral more ſoon after their arrival. The reſemblance of this fever to a true peſtilence, was farther evinced by this remarkable incident. A parcel of tents were put on board the ſame bilanders with the ſick, and which being to be refitted at Ghent, were put into the hands of a tradeſman, who employed twenty-three journeymen about the work; but thoſe unhappy men were quickly ſeized with a malignant fever, and ſeventeen of them died. 1743.

The proportion of men left in the hoſpitals at the end of the campaign, to thoſe who came ſafe into winter quarters, was about 3 to 13.

The winter quarters aſſigned the troops, were Bruſſels, Ghent, Bruges and Oſtend: of all which towns, Bruſſels is the higheſt and beſt aired. But in winter, as there is little exhalation, and conſequently no dangerous moiſture in the air, the ſituation of the place is a matter of leſs conſequence; ſo that the great concern is only to provide the men in warm and dry barracks, with a ſufficient allowance for fuel. The beſt quarters were at Bruſſels, and accord-

1743. ingly the ſickneſs was nothing there, in compariſon of what it was at Ghent and Bruges; where the dampneſs of the barracks, conſpiring with ſome remains of the diſeaſes of the field, occaſioned frequent diſtempers in the beginning of winter.

For, notwithſtanding the troops returned to Flanders in apparent good health, yet, ſoon after their arrival, ſeveral were taken ill with remitting fevers, attended with inflammatory ſymptoms; whereby it appeared, that the ſeeds of this fever might lie ſome while latent in the body, and break out upon colds caught at any time before the froſts have recovered the tone of the bowels, braced the fibres, and purified the blood.

In the beginning, therefore, of winter, theſe remittents were the prevailing diſtemper of the garriſons; and there were beſides ſeveral jaundices without any fever. At Bruſſels, where, as we obſerved, the barracks were dry and warm, the fevers were few, and the jaundice rare: but at Ghent and Bruges, both were numerous. Yet the continuance of this fever was ſhort, for it diſappeared in December; nor was ſucceeded by any other diſtemper, but coughs and inflammations from colds; exactly as in the preceding winter. 1744.

No epidemic appeared in the ſpring. The only diſeaſe, beſides colds, was the malignant fever, which came from Germany, and was ſtill fatal in the hoſpital at Ghent. And ſome degree of the ſame diſtemper was alſo felt at Bruges, where the regimental infirmaries were at firſt crouded.

## CHAP. IV.

## *A general account of the* DISEASES *of the campaign in Flanders, in the year* 1744.

THE army firſt encamped at Anderlecht, within a league of Bruſſels, on the 13th of May. On the 1ſt of June they moved to Berleghem, and lay there till the 31ſt of July; when they croſſed the Scheld and encamped at Anſtain, in the territory of Liſle, where they remained almoſt all the reſt of the campaign.

The Britiſh took the field with five new battalions, and at Berleghem there was a reinforcement of five more from England; which, with the *additionals* to the dragoons, and recruits, made the national troops exceed

1744. in number thoſe of the former campaign, by upwards of 10000.

The firſt three days of the encampment were warm for the ſeaſon, the ſucceeding ten were cold; but afterwards the weather turned very mild, and keeping dry without exceſſive heat, the ſummer proved in general very favourable for the field. Before the army paſſed the Scheld, there having been no hard duty, and the forrage being at hand, the men ſuffered little by wet cloaths or fatigue; hence the ſickneſs was ſo moderate, that during ten weeks encampment, our troops had ſent little more than 600 into the hoſpitals of Ghent and Bruſſels: which was not above $\frac{1}{43}$ part of the whole.

Two thirds of theſe caſes were merely inflammatory, being either pleuriſies, peripneumonies, quinſeys, rheumatiſms with fevers, or the like. For the reſt, they were moſtly vernal agues, with a few fluxes, and other caſual diſtempers: and theſe likewiſe with ſome inflammation, as in the beginning of the laſt campaign.

Now as to the inflammatory diſorders of a camp, it may be proper once for all to obſerve, that upon firſt taking the field, coughs and ſtitches, with high inflammations of the lungs and pleura, are the common effects of taking cold; but towards the ſummer ſolſtice, as the weather grows warmer, the breaſt is leſs liable to be affected, and the colds are rather productive of a continued fever, with ſizy blood, than of any of the above mentioned inflammations. Moreover, that this fever, with proper management, may generally be removed in a few days; but when neglected in the beginning, by omitting bleeding, by continuing in camp, or being carried in waggons to diſtant hoſpitals, it becomes at laſt very dangerous. 1744.

After the army came into the territory of Liſle, an hoſpital was opened at Tournay, on the 23d of Auguſt; into which were at firſt ſent but 50 ſick: and theſe being all that were taken ill ſince the army croſſed the Scheld, was a proof how healthful the troops then were. But in this ſmall number there appeared a change in the diſtempers, from inflammatory to bilious: as moſt of the caſes were either remitting fevers, or dyſenteries. So that now there ſeemed only wanting ſome alteration of weather, to make the bilious diſeaſes as epidemic as the foregoing cool and mo-

1744. moderate ſummer would allow. Accordingly a change came; for, from the end of Auguſt to the middle of September, there fell a great deal of rain; and the men who were out on forraging parties, were not only often wet, but the ground whereon the foot encamped, being low, retained the rain water. Hence, by the firſt of October, there were in the hoſpital above 450 ill of the dyſentery; beſides ſlighter caſes, that remained in the camp.

This, however, was the height of the diſtemper; which, conſidering the number of our troops, was as nothing, compared to its frequency in the former campaign. The reaſon was plain; the laſt ſummer had been ſo hot, that by the end of June, the humours had already acquired a high degree of acrimony; in which ſtate, the rains at Dettingen giving a ſudden and general check to perſpiration, many were then ſeized at once; and from thence ſprung the infection, which was kept up by the hot weather, and the privies of a long encampment. Whereas, by the temperature of this ſummer, the dyſentery did not appear till very late, and then could make no progreſs for want of heat.

The remitting fever of the camp being more regular in its appearance than the flux, began but a little later than it did the year before, was frequent in the end of September, but was at no time ſo general. The ſymptoms were alſo more moderate, tho' ſimilar: there was rarely any yellowneſs, as in the former campaign; but when the weather grew cold, it was often joined with a cough, infarction of the lungs, or rheumatic pains: which ſymptoms, as was ſaid above, did not properly belong to the fever, but were only acceſſions to it, from extraordinary colds. 1744.

The rains were ſucceeded by a tract of fine weather, which continued till the beginning of October; but this again being followed with heavy and cold rains, the ſickneſs muſt have increaſed, had not the campaign ended ſoon after. For on the 16th of that month, ſome of the troops were ſent into winter quarters; and in a few days more, they were followed by all the reſt.

On breaking up, there were about 1500 ſick in the hoſpitals at Tournay, Ghent, and Bruſſels: which was only the 17th part of all that took the field. The amount of the deaths

1744. during the campaign, and of thoſe who were left in hoſpitals at the end thereof, did not exceed 300. The mildneſs of the ſeaſon, the dry encampments, the frequent exerciſe given to the troops by forraging parties, when the camp was fixed at Anſtain, and the early retreat into winter quarters, all concurred in preſerving the health of the army.

The troops returning ſo ſoon and well into garriſon, carried with them few ſeeds of diſtempers. The dyſentery had been for ſome time on the decline; and was but a little revived by the wet weather. And as half the army had been hardened by two campaigns, the remitting fever was confined in quarters chiefly to the recruits and new regiments, who had encamped this ſummer for the firſt time.

The Britiſh returned to the ſame garriſons they left. At Bruſſels the general hoſpital was kept up; but at Bruges and Ghent, none were appointed: the regimental ſurgeons getting barracks for their ſick, with an allowance of medicines, and all other neceſſaries, at the publick expence. In each of theſe garriſons was ſtationed an hoſpital phyſician, to whom the ſurgeons were to apply occaſionally for aſſiſtance.

1744. ſiſtance. Which ſcheme of ſeparate regimental infirmaries, tho' only intended to ſave the expence of one common and great one, anſwered another purpoſe; which was, that of dividing the infection, and thereby guarding againſt a malignant fever, the common and fatal conſequence of a large and crouded hoſpital.

At Oſtend remained two battalions, which having garriſoned the town during the campaign, had enjoyed good health; with the exception of a few autumnal agues. The remitting fever was not known among them; and the intermittents, with a few gentle fluxes, were confined to thoſe ſoldiers only, who by reaſon of out-guards and night-duty, were moſt expoſed to colds and wet. But as a proof of the healthfulneſs of the place and ſeaſon, neither our officers nor the inhabitants had any diſtemper among them.

CHAP.

## CHAP. V.

### *A general account of the* DISEASES *of the campaign in Flanders, in the year* 1745.

1745. ON the 25th of April, the Britiſh troops took the field, encamping again at Anderlecht; and on the 9th of May, the army came up to Briſſoel.

The weather being mild, the ſickneſs was moderate; but altogether like that of former campaigns. Inflammatory diſorders were common, and, as before, moſtly in the ſhape of a pleuriſy, or peripneumony: ſeldomer in the form of an acute rheumatiſm, as the weather was yet too cold for tempting the men to ſleep on the graſs, the common cauſe of the diſtemper. The vernal intermittents were alſo of an inflammatory kind; as were likewiſe the few fluxes that appeared: the only new diſeaſe was the ſmall pox, which came from England with the recruits; but did not ſpread: and at no time have we known it of any conſequence in a camp.

The battle of Fontenoy was on the 11th, 1745. on which day the weather was fair, and the following night ſo dry and mild, that tho' moſt of the men lay without cover, and all had been extremely fatigued, yet no ſickneſs enſued. Next day an hoſpital was made at Ath, in the cazernes of St. Roc, which took in about 600 wounded.

On the 16th of the ſame month the army removed from Ath, and encamped at Leſſines; where it continued till the 30th of June. The greateſt part of May being dry, and moderately warm, was favourable, both to the wounded, and to the men in camp. But June being cold and wet, the vernal agues and fluxes returned; and, tho' little affecting the old and hardened troops, were ſevere on Price's and Mordaunt's regiments; which, with the *draughts*, were all new, and had for the firſt time encamped at Leſſines.

From this place the army moved to Grammont, where it ſtaid ten days: and from thence marching to Bruſſels, encamped on the plain of Dieghem; which being a dry, open, and elevated field, is reputed the moſt

1745. healthful ground for a camp in the Netherlands. From hence, after a month's ſtay, the army moved to Vilvorde; where the ſoil being ſtill dry, the country airy, and the heats temperate, the men continued to enjoy extraordinary health. For in the middle of September, few battalions returned above 12 ſick altogether; which was as low a number as could be expected in the beſt quarters.

The temperature of the weather, the drineſs of the ground, and the little fatigue the troops underwent, conſpired to make the autumn, naturally a ſickly ſeaſon, extremely healthful. The dyſentery had been only frequent in the new regiments, and was eaſily cured: neither could the remitting fever ever be called epidemic: For, tho' it began about the end of Auguſt, and was the moſt frequent diſeaſe through the reſt of the campaign; yet it was ſo inconſiderable, that no battalion at any time returned above ſeven or eight ill of that diſtemper; and thoſe with milder ſymptoms than had been ſeen in former campaigns.

It was obſervable, when the troops made another ſmall remove, to form a line along the great canal, the ground being low and cloſe planted, the effects of moiſture began preſently to appear: but upon returning to the former camp, they were no longer ſeen. 1745.

On the 24th of October, the weather ſtill continuing fair and temperate, the camp broke up, and the troops went into winter quarters. Some time before this, ten battalions had been ſent home; and in the beginning of November, the whole Britiſh infantry, with part of the cavalry, being recalled to ſuppreſs the rebellion, marched to Willemſtad, and embarked for England.

Thus far an account of the health of the main body of our troops: the ſtate of the ſeparate corps was as follows. In the end of Auguſt, Oſtend having ſurrendered, the garriſon, conſiſting of five Britiſh battalions, was conducted to Mons; where they ſtaid about three weeks. Theſe men had been ſo healthy, that when they retired upon the capitulation, notwithſtanding the fatigues of a ſiege, they left only ten ſick: but the ſame corps being put into damp barracks at Mons, whilſt the town itſelf was ſurrounded with an inundation, the autumnal diſeaſes prevailed ſo

1745. much, that in that ſhort time, 250 were taken ill and left behind, when the reſt marched to Bruſſels. The caſes were dyſenteries, remittents, and intermittents; and to theſe fevers, as is uſual towards the end of autumn, coughs, rheumatic pains, and other ſymptoms of cold were joined: not without ſome mixture, as it appeared, of the hoſpital fever, acquired by the cloſe and bad accommodation they had at Mons.

Handyſide's regiment, another detached corps which had come over this ſummer, was, about the middle of July, ſent into the citadel of Antwerp. The air of that city is moiſt, and the fort is particularly expoſed to the damps of the neighbouring marſhes. The barracks were, moreover, on ground floors, and extremely damp; in conſequence whereof the dyſentery, together with remittents and intermittents of a bad kind, became general. In the beginning of October, 163 were returned ſick from that battalion only; which was five or ſix times more than any other regiment had in the line. This extraordinary diſproportion may, in part, be imputed to the newneſs of the men, but much more to the damps; ſince the other new regiments 1745. that were then in camp, ſuffered very little: and in the town itſelf, fluxes, remittents, and intermittents, were alſo frequent among the inhabitants, whilſt the people of Bruſſels enjoyed perfect health. When Ghent was taken, part of Rich's dragoons having eſcaped from thence, retired to Antwerp, and were ſeized with the epidemics of the place; whilſt the remainder of that regiment, which lay in camp, continued entirely free of both fever and flux.

Upon the whole, when the campaign ended, there were left in the ſeveral hoſpitals of Antwerp, Bruſſels, and Mons, about 1000 ſick, including all caſes: a very ſmall number, conſidering that during this campaign, there had been at one time in Flanders, beſides the cavalry, 29 battalions; whereof ſome had never before taken the field. The deaths from the beginning to the end of the campaign, excluſive of thoſe who were killed in battle, or died of their wounds, did not exceed 200. In both this and the laſt ſummer, the heats were moderate, the troops were little harraſſed by fatigues, and, in general, little expoſed to

1745. wet cloaths or damps; and the return to winter quarters being early, were ſo many concurring circumſtances to make this, of all, the moſt healthful campaign.

## CHAP. VI.

### *A general account of the* DISEASES *of the campaign in Great Britain,* 1745 *and* 1746.

A Little before the end of the campaign 1745, the three battalions of foot guards, and ſeven others, embarked in Holland, and landed in the ſouth of England: the paſſage was ſhort, and the troops leaving the field before the nights turned cold, arrived in perfect health. But the reſt of the infantry having lain longer in camp, embarked later in the ſeaſon; and being detained long on board by contrary winds, arrived ſickly at Newcaſtle, Holy-iſland and Berwick. For, ſome of the men, during the voyage, fell ill of remitting fevers; which, by the crouds and the foul confined air of the hold, were ſoon converted into the malignant fever of the hoſpital.

An hoſpital was made at Newcaſtle, in 1745. which the ſick, as they landed, were lodged; and this houſe alſo taking in thoſe that fell ill in the army under the command of Marſhal Wade, the air became ſoon corrupted and infectious. Not only the nurſes, and thoſe who were conſtantly in the wards, were thereby ſufferers, but alſo the medical attendants, tho' leſs confined to the putrid air: inſomuch that three of the town apothecaries, with four of their apprentices, and two journeymen, were ſeized with the contagion, and died.

Ligonier's and Price's regiments landed at Holy-iſland. Theſe had embarked in perfect health, leaving all their ſick behind at Antwerp; but before they arrived, were in the ſame condition with thoſe that came to Newcaſtle. The diſaſter was unforeſeen, and unprovided for. Ninety-ſeven were taken out of the ſhips ill of the malignant fever, whereof 40 died; and the people of the place receiving the infection, in a few weeks buried 50; which was a ſixth part of the inhabitants of that iſland. The ſame fever was carried into Berwick, by the troops that land-

1745. ed there; but there being fewer ſick, the diſtemper did not ſpread.

In the beginning of December, a body of troops, conſiſting of 12 battalions, and 3 regiments of cavalry, under the command of his Royal Highneſs the Duke, aſſembled at Litchfield. The quakers had made a preſent of flannel under-waiſtcoats to the men; which was a ſeaſonable proviſion for a winter campaign. The march was dry; the army encamped at Packington for three days only; at Stone, the men lay for one night upon their arms: but at all other times, being every night in quarters, having plenty of ſtraw, fuel and proviſions, they kept their health as well as could be expected in that ſeaſon of the year.

Towards the end of December, moſt of the infantry were ſent into quarters, whilſt the cavalry, and 1000 foot, advanced to Carliſle. The ſick, as they fell ill, were left in towns on the road, to the care of the ſurgeons and apothecaries of the ſeveral places, and were well treated.

The troops having ſtaid ſome days at Litchfield, a greater number of ſick was left in that town than in any other; on which account

the work-houſe was fitted up for an hoſpital: 1745.
but there being too many admitted, the common fevers became malignant, and ſeveral died. But in the other towns where the men were taken ill, and where there was no common hoſpital, that fever was unknown: ſo that the diſtempers, without any malignity, run their natural courſe, and generally came to a happy iſſue.

The autumnal remitting fever, diſguiſed with many ſymptoms of cold, could be traced in the troops which came over from Flanders, until the froſts in December put an end to it. But the prevailing diſtempers were hard coughs, ſtitches, pleuritic and rheumatic pains, with a few fluxes, the natural conſequences of expoſition to colds and rains on duty, or of wet feet on the march. There were alſo ſome intermittents; but all with ſuch a mixture of coughs and infarctions of the lungs, as made bleeding the moſt neceſſary remedy. In general, large and repeated bleedings were ſo requiſite, that in every town through which the troops paſt, and where ſick were left behind, the phyſician of the army believed the ſurgeons and apo-

1745. thecaries of the place more than half inſtructed about the cure of the patients committed to them, when he had inculcated the neceſſity of large and repeated bleedings: for the men were at this time well fed, and by the colds their blood had become extremely ſizy.

Carliſle was inveſted in the beginning of January, and taken in a few days. The ſhortneſs of the time, the mildneſs of the weather for the ſeaſon, and the good cover which the troops found near the works, made the ſickneſs ſo inconſiderable, that only one died there. And during the whole expedition, this body did not loſe above 40 men; tho' there had been in all between 600 and 700 ſick.

On the 10th of February the Duke's army marched from Edinburgh towards Perth. It conſiſted of 14 battalions, and three regiments of cavalry; which being too large a number to be all billetted in ſo ſmall a place, two battalions were quartered in churches. Proviſions were in plenty, but the quarters were generally cold; ſo that a great many fell ill of the common inflammatory diſtempers of the winter, and in a greater degree than before. The hard coughs in particular, with inflammations of the pleura and lungs were moſt frequent. 1746.

In the beginning of March the troops removed from Perth to Montroſe, and from thence to Aberdeen, leaving 300 ſick behind them; who were well accommodated in the corporation halls and private houſes of theſe towns.

Till the end of March, the whole infantry was quartered in Aberdeen; but afterwards nine battalions were cantoned at Inverurie and Strathbogie: and at this time, one battalion more landed and joined the army.

The weather being all this time extremely ſharp, with froſt and ſnow and eaſterly winds, the diſtempers continued to be highly inflammatory, tho' of the ſame kind with what uſually occur in winter quarters. Whilſt the men ſuffered by cold beds, guards and out-duties, or by their own miſmanagement, neither the ſeaſon nor climate gave inflammatory diſorders to the officers, who had warm quarters, and were leſs expoſed to cold: but in the beginning of March, when the weather was very ſharp, ſome of them were ſeized with the gout.

1746. The ſick were well lodged in the hoſpital belonging to the town, and in other large houſes; where having a free air, they were preſerved from the hoſpital fever. Including thoſe at Inverurie and Strathbogie, about 400 ſick were left behind, when the army moved; but of this number a ſmall proportion died.

On the 23d of April the army firſt encamped at Cullen; next day it paſſed the Spey: on the 27th * after the battle of Culloden, the troops advanced to Inverneſs, and encamped on the ſouth ſide of the town.

At Strathbogie and Inverurie the duty had been conſtant, to guard againſt a ſurprize; one day's march had been long and rainy, the encampment early, and many colds caught from wading the rivers: all theſe circumſtances concurred to make the ſickneſs conſiderable. Before the army reached Inverneſs, about 60 or 70 men being taken ill, were left in towns by the way; and after the encampment the inflammatory diſtempers daily increaſed. Theſe were the more ſevere, as the ſeaſon was early, the climate cold, and the camp expoſed in an open country to piercing winds.

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* N. B. The new ſtyle is continued.

The pleuriſies and inflammations of the lungs, 1746. in particular, were violent, and tended quickly to ſuppuration; if large and repeated bleedings, and other parts of cure, were not ſpeedily uſed.

At Inverneſs two malt-barns received the wounded, which were in all 270. There were many with cuts of the broad ſword, till then uncommon wounds in the hoſpitals; but theſe were eaſily healed, as the openings were large in proportion to the depth, as they bled much at firſt, and as there were no contuſion and eſchars, as in gun-ſhot wounds, to obſtruct a good digeſtion.

Beſides the wards for the wounded, two well aired houſes were turned into hoſpitals for the ſick. The regimental ſurgeons had, moreover, orders to provide quarters in the town for lodging their men, as they were taken ill; with the liberty, to ſend to the general hoſpital, ſuch a proportion of the worſt caſes, as might leſſen their labour, without crouding thoſe houſes. By this diſperſion of the ſick, and the preſervation of a pure air in the wards, it was hoped that a contagion might be moderated, if not prevented: and which

1746. otherwiſe more than ever impended, by reaſon of the ſmallneſs of the town, the jails filled with priſoners, many of them wounded, the proſpect of a long encampment and camp diſeaſes, the crouds and filth of a place where the markets of an army were kept; and laſtly, a morbid ſtate of air, from the meaſles and ſmall pox, which had prevailed in town before the arrival of the army.

All theſe circumſtances concurred to make us apprehend the worſt; wherefore all care was taken in having the ſick divided, and their wards kept clean. An order was likewiſe given to clean the jails every day, to remove ſpeedily the bodies of thoſe who died: and to prevent crouding, part of the priſoners were put on board ſome ſhips lying in the road, with a liberty of coming upon deck for the air.

In this manner the month of May paſt over without any infection, and the weather for the ſeaſon being unuſually dry and warm, the inflammatory ſickneſs in camp had viſibly declin'd, when an unforeſeen accident rendered all precaution fruitleſs, and made the ma-

malignant fever more general and fatal than 1746. had been at firſt apprehended.

For, about the end of the month, Houghton's regiment, which, with three more, had been ſent as a reinforcement, landed at Nairn, and joined the army. A few days after, twelve men of that corps were ſent into the hoſpital with fevers, and were blooded largely upon admiſſion. But next day not obſerving the coughs, ſtitches, and rheumatic pains, the common ſymptoms of the fever at that time prevailing in the camp; and, moreover, finding that the bleeding had ſunk the pulſe, and that ſome had an uncommon *ſtupor*, the phyſician immediately referred this fever to the malignant kind; concluding it had taken its riſe from the confinement and bad air of the ſhips during the voyage: yet he thought it ſtrange, that this battalion, and none of the reſt, ſhould be ſo ſickly.

But upon farther enquiry, he was informed, that this fever came directly by contagion from the true jail diſtemper, communicated in the following manner. Some months before, a French ſhip had been taken off the coaſt of England, on board of which were

1746. troops, ſent to aſſiſt the rebels; and, in that number, a few Engliſh ſoldiers, who had formerly deſerted to the French in Flanders. Theſe men, upon being taken, were thrown into jails in England; where they were kept till an opportunity offered of ſending them by the tranſports, to be tried by a court-martial at Inverneſs. The priſoners were thirty-ſix in number, and having brought with them the jail diſtemper, gave it to this regiment, with which they were embarked.

In three days after coming on ſhore, ſix of the officers were ſeized with it; and the regiment, in the few days it lay at Nairn, left about eighty ſick; and in the ten following it lay at Inverneſs, ſent into the hoſpital about 120 ill of the ſame fever. And tho' the virulence of the diſtemper diminiſhed in their march afterwards to Fort-Auguſtus, and from thence to Fort-William, yet the men remained for ſome time very ſickly.

The ſymptoms of this jail diſtemper were in every point ſo like thoſe of the hoſpital fever, that, as they were but conjectured to be the ſame before, they were now proved to be really ſuch. Being thus introduced, it ſoon ſpread, not only in the hoſpitals, but among the inhabitants of the town: whilſt the ordinary camp diſeaſes, after the beginning of May, very ſenſibly declined, both in number and acuteneſs. The weather being all the month of May, not only dry, but warm for the climate, the camp at this time abounded in thoſe diſeaſes only that always attend the beginning of a campaign; except that the agues were fewer, and diarrhœas more frequent. For theſe laſt accompanied almoſt every diſorder, but were very ſlight, and ſeemed not to be ſo much the effects of colds, as of the river water which comes out of Loch Neſs, and has always been accounted laxative to ſuch as were unuſed to drink it. Theſe fluxes either went off of themſelves, or ſoon yielded to aſtringents. 1746.

On the 3d of June four battalions were left at Inverneſs, and nine, with a regiment of horſe, marched to Fort-Auguſtus, leaving in the hoſpital about 600 ſick, beſides the wounded.

The new encampment was made in a little valley, cloſe by the fort, at the end of Loch Neſs, and was ſurrounded by mountains, un-

1746. except where it opened upon the lake. This is a large body of freſh water, twenty-four miles in length, and about a mile broad, contained between two parallel ridges of mountains, and affords the proſpect of a vaſt canal. It is curious on account of its great depth, and never freezing. The common ſoundings are from 116 to 120 fathoms, and in one place they reach to 135. The water is perfectly ſoft and ſweet, and readily bears ſoap: yet, to ſome, it proves laxative, and is always diuretic. The people of the country recommend it in the ſcurvy: and indeed from theſe qualities, there is reaſon to believe it may be proper in ſome ſpecies of that diſtemper. A great many ſmall but heavy ſtones, of the micaceous kind*, are found upon the beach; and it is not improbable the bottom may be covered with the like. But, whether the water is preſerved from freezing by ſome mineral principle, its vaſt depth, or ſome hot ſprings, is uncertain. As it is well ſtored with large and good fiſh, and is without any particular taſte, it ſhould ſeem to be little, if at all, im-

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* *Mica,* particulis nitidis, ſquamoſis, planis. LINNÆI Syſtem. nat. lapid. regn. Ord. III.

preg-

1746. pregnated with any mineral. And, beſides that it is always cool, there is the leſs ground to aſcribe the heat to any ſpring at the bottom, ſince none of that kind are to be found any where elſe in the country. The lake is fed by four ſmaller rivers, which are all liable to freeze; and it empties itſelf by the Neſs, a large clear river, which, after a courſe of ſix miles, runs into the frith of Murray, at Inverneſs: and, like its ſource, is never known to have ice.

Fort-Auguſtus has always been a healthy garriſon, but Fort-William, which lies on the weſt coaſt, has ever been ſickly; and in particular, ſubject to agues and the bloody flux. On that part of the iſland, there are continual rains; and the fort ſtands in a narrow and moiſt valley, ſurrounded by mountains: ſo that there is not only a greater fall of rain, but a ſlower evaporation there than in any other part of the country.

At Fort-Auguſtus, there being no ſtraw to be had for the camp, the men were ordered to cut the heath and uſe it for bedding: and it was obſervable, that ſuch as were moſt careful in providing themſelves with a due

1746. quantity, and renewing it often, were leaſt ſickly.

The weather, for the laſt half of May, and beginning of June, had been uncommonly dry and warm; but afterwards it grew cold and rainy. Upon which change, the dyſenteries began to be more frequent; but there being likewiſe continual winds, to keep the ground moderately dry, and to prevent the increaſe of the diſtemper by contagion, it never became general.

The flux, with every other diſeaſe of this camp, being attended with ſizy blood, and other marks of a conſiderable inflammation, made large and repeated bleedings much more neceſſary here than in a warmer climate. But vomits were not ſo efficacious in curing the dyſentery as they had been abroad; tho' at this time they were remarkably of greater ſervice than they had been during the ſpring: a proof, that even in this latitude, ſome degree of corruption of the bilious humours could be traced in ſummer.

Beſides the dyſenteries, there were fluxes of a milder kind among the ſoldiers, proceeding either from errors of diet, wet feet, or wet cloaths, or accompanying fevers, when, by their want of ſufficient covering, the ſick could not be relieved by ſweating. 1746.

The inflammatory fevers, in proportion as the ſummer advanced, appeared with leſs violent ſymptoms; and unleſs by extraordinary expoſitions to colds, had not now ſo often the form of a peripneumony, pleuriſy, acute rheumatiſm, or the like; but were chiefly diſtinguiſhable by ſizy blood.

The intermittents partook both of a bilious and inflammatory nature; and therefore required both bleeding and evacuations of the *primæ viæ.* But they never were numerous, as the conſtant winds prevented a moiſt air, and ſoon dried the ground after rain.

In this camp there was no accommodation for the ſick, but in a few ſmall neighbouring huts. Bad air being thereupon apprehended, as many as could be tranſported, were ſent to Inverneſs: by which precaution the hoſpital fever was retarded, but not prevented. For when the ſick multiplied, theſe infirmary huts were ſoon crouded, the air was vitiated, the diſtemper broke out, and was fatal. And when the malignant fever was

1746. joined to any common inflammatory diſeaſe, a mixture of the two aroſe, which made the moſt perplexing caſes; as the indications of cure were ſo very contradictory.

In the middle of Auguſt the camp broke up, leaving at Fort-Auguſtus between 300 and 400 ſick; which were afterwards tranſported to Inverneſs. By this time the hoſpital fever was frequent among the inhabitants of that town, but was leſs mortal than uſual, on account of the coolneſs of the weather, and open ſituation of the place.

From the middle of February, when the army croſſed the Forth, to the end of the campaign, there had been in hoſpitals upwards of 2000, including the wounded; of which number near 300 died, and moſtly of this malignant fever.

## CHAP. VII.

## *A general account of the* DISEASES *of the* CAMPAIGNS *in Dutch Brabant, in the years* 1746 *and* 1747.

THIS was the ſtate of the health of the troops in Britain. In the Low Countries there had been from the beginning of this campaign, only three battalions and 1746. nine ſquadrons Britiſh. In the month of Auguſt four battalions were ſent from Scotland, to join the army; which landing at Willemſtad, and remaining ſome time in that low and marſhy ground, during the height of the ſickly ſeaſon, were preſently afflicted with the bilious remitting and intermitting fevers of the country; and were obliged, before they marched, to ſend a great many ſick into the hoſpital at Ooſterhout.

This campaign being attended with ſeveral fatiguing and wet marches in autumn, after conſiderable heats during the ſummer, and the troops having kept the field late, were very ſickly. For, at the end of the campaign, excluſive of the wounded from the battle of Rocoux, about 1500 of our men were in hoſpitals, which made nearly a fourth part of the whole number. But in the diſeaſes there was nothing uncommon, being ſuch as regularly occur in the like ſeaſons and weather *.

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* As the author attended the army in Scotland, during this campaign, he could give no more particular account of the diſeaſes of the troops employed in the Low Countries.

1747. In the enſuing ſpring, 1747, the army took the field on the 23d of April, encamping firſt at Gilſen, near Breda. The Britiſh, conſiſted at firſt of 15 battalions and 14 ſquadrons; and ſome time after, ſeven battalions more were ſent from England: but four of theſe being employed in Zealand, and three in the lines of Bergen-op-Zoom, they never joined the army.

The firſt days of encampment were extremely cold, then the weather grew mild, and continued ſo till the beginning of June, when it became hot. From taking the field, till towards the end of June, there was little rain; and all the camp grounds were dry.

In the firſt ſix weeks, about 250 were ſent into hoſpitals; which was moderate, conſidering how early the troops had left their quarters. The diſtempers took their uſual courſe; that is, were moſtly inflammatory.

The battle of Laffeld was on the 2d of July, and from about that time, till towards the end of the month, there fell a good deal of rain, which cooled the air. About 800 wounded were brought into Maeſtricht; where, among other places, a large church was employed for an hoſpital, which not only accommodated a great number; but, by its ſpacioufneſs, prevented, throughout the ſeaſon, the hoſpital fever, tho' many ill of fluxes and other putrid diſeaſes lay in it. 1747.

After the battle, the army croſſed the Maes, and encamped at Richolt. Some time after they moved to Richel, and afterwards to Argenteau; but ſtill kept in the neighbourhood of Maeſtricht. The ſituation of all theſe camps was dry and airy; and there being at firſt no extraordinary night duty, the diſtempers were few, and but little inflammatory. The dyſentery did not yet appear, unleſs among the Guards, which, at Richolt, happened to encamp on a low ground, then a little wet with the rains: but the caſes were not many, and the ſymptoms were gentle.

From the 20th of July, till the 10th of September, the weather was ſultry; and till the middle of Auguſt, the nights were nearly as hot as the day. During all that time, the camp was healthy, but the wounded ſuffered; for, the extreme heat either brought on putrid fevers, or, by relaxing the fibres, and rendering the humours acrid, ſometimes kept the wounds from cloſing, and, at other times, diſpoſed

them,

1747. them, when healed, to break out afreſh. About the middle of Auguſt, tho' the days were ſtill hot, yet the nights began to cool, and frequent dews to fall; and from ſuch interchanges, to which the men in camp were continually expoſed, the dyſentery took its riſe: as it uſually happens upon the perſpiration being check'd by damps, after the humours have been rarified by hot weather.

Above half the ſoldiery had the diſtemper more or leſs; and it was alſo more frequent with the officers than had been hitherto known. The contagion run through the adjoining villages, and was very mortal among the peaſants; who either wanted medicine altogether, or uſed what they had better been without. But Maeſtricht ſuffered little, notwithſtanding its conſtant intercourſe with the camp: for, this town ſtanding on a large river, in an open country, is well aired, and particularly clean.

Notwithſtanding the vio'ence and frequency of the flux, few died of it; for the ſick were more diſperſed, the hoſpitals were better aired than uſual, and the regimental ſurgeons having learned by experience, either perfectly cured the men in their field hoſpitals, or made ſome neceſſary evacuations before they ſent them into Maeſtricht.. 1747.

In the beginning of October, there fell a great deal of rain; and ſuch of the men as happened to be expoſed to it, were ſeized with the dyſentery: but to the army in general, it was a favourable circumſtance, as it cooled the air, and thereby ſoon put an end to the diſtemper.

About this time the autumnal remitting fever, which had appeared about the end of Auguſt, was now become frequent; but with nothing new, either in ſymptoms or cure.

In a few days after the rains, the army moved towards Breda; and as the weather began then to be cold, coughs, pleuritic ſtitches and rheumatic pains were common, either by themſelves, or combined with the remitting fever.

On the 12th of November the troops got into winter quarters.

Tho' there had been much ſickneſs during the campaign, there was little mortality; and at the end of it, conſidering how late it was,

1747. the numbers ſent into the hoſpital, from the main body, were moderate.

But in Zealand the ſickneſs was exceſſive among the four battalions, that had been there ſince the beginning of the campaign. Theſe, partly in camp and cantonements, lay in South Beveland and in the iſland of Walcheren, two diſtricts of that province; and both in field and quarters were ſo very ſickly, that at the height of the epidemic, ſome of theſe corps had but 100 men only fit for duty; which was leſs than a ſeventh part of the battalion. That of the *Royal*, in particular, at the end of the campaign, had but four men that never had been ill. Now the nature of the air in Zealand, with its effects in producing bilious remitting and intermitting fevers, with fluxes, having been already ſhewn*, it will be ſufficient to refer to that place for a general account of thoſe diſtempers; and for a more particular one, to the third part of this work. I ſhall only obſerve here, that theſe epidemic fevers, by reaſon of the great heats of the ſeaſon, not only began more early than uſual, but were more ſevere; and fully as fatal to the natives as to us. The officers were alſo ſickly; tho' from more timely and greater care, their fevers were attended with leſs ardent and malignant ſymptoms, than thoſe among the common men. But Commodore Mitchell's ſquadron, which lay all this time at anchor in the channel between South Beveland and the iſland of Walcheren, in both which places the diſtempers raged, was neither afflicted with fever nor flux; but amidſt all that ſickneſs enjoyed perfect health. A proof, that the moiſt and putrid air of the marſhes was diſſipated, or corrected, before it could reach them; and that a ſituation open to the wind, is one of the beſt preſervatives againſt the maladies of a neighbouring low and marſhy country. 1747.

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* Ch. 1.

In proportion as the autumn grew cool, theſe fevers abated of their ardour, and formed more eaſily into intermittents; tho' ſtill irregular, and of a bad kind. The dyſentery was never general, but not uncommon; and it was obſervable, that thoſe who were ſeized with it, uſually eſcaped the fever; or, if any had both, it was alternately; ſo that when the flux appeared, the fever ceaſed, and

1747. when the firſt was ſtopt, the other returned. From which it appears, that tho' the two diſtempers, were of a different form, they were yet of a ſimilar nature.

As to the three other battalions that were ſent to Bergen-op-Zoom, they encamped in the lines of that place, and remained there during the campaign. The town itſelf ſtands on a gentle eminence, but the country around it being in ſome parts marſhy, the air, tho' not ſo moiſt as that of Zealand, was leſs pure than that of Maeſtricht. The ſickneſs was in the ſame proportion, being both in kind and violence of a middle degree between what prevailed in theſe two places: that is, the fevers were as much below the rage of thoſe in Zealand, as they were above the mild remitting fevers of the camp. And if the dyſenteries were more frequent in the lines of Bergen-op-Zoom than in Zealand, the reaſon was, that the men on this duty were oftner expoſed to rain; and by being in a large and fixed camp, had the diſtemper more by contagion.

At the end of the campaign, there were in hoſpitals from the main body of the Britiſh troops, and all detachments, (excluſive of the wounded) above 4000; which was ſomething 1747. more than a fifth part of the whole number. But it is to be remarked, that the four Zealand battalions furniſhed near one half of theſe: ſo that when they went into winter quarters, their ſick were in proportion to their men in health, nearly as four to one.

## C H A P. VIII.

### *A general account of the* DISEASES *of the campaign in Dutch Brabant, in the year* 1748.

THIS campaign, which was the laſt, 1748. opened very early. For, upon the 8th of April, the army encamped at Hillenraet, near Roermond, with 15 battalions and 14 ſquadrons Britiſh. From the time of taking the field till the beginning of May, the weather was extremely cold, with ſome ſnow, high winds and rain; but the duty was little, and the ground naturally dry.

On the 12th of May the army left Hillenraet, and in a few days came to Niſtelroy, where they encamped for the laſt time; leaving in the hoſpital at Cuick about 500, and thoſe,

1748. as uſual, moſtly inflammatory caſes. There was an uncommon number of intermittents, which were not original diſtempers, but generally relapſes in thoſe men, who, in the preceeding campaign, had been ſeized with fevers in Zealand, and in the lines of Bergen-op-Zoom. And theſe too, through the coldneſs of the ſeaſon, were alſo attended with ſome degree of inflammation.

In this camp the Britiſh were augmented by ſeven battalions from England.

The weather was now warm, and the days often hot; but ſome ſeaſonable rains, with thunder and lightening, prevented ſultry heats, and purified the air of its moſt inſalutary parts. For, it has been remarked of thunder, that as it is generated moſt in cloſe and marſhy countries, it may have, for a final cauſe, the cooling and correcting the putreſcency of the air, when the heats are moſt intemperate *. The ground was alſo dry, and the camp airy; ſo that the ſickneſs was inconſiderable as long as the troops kept the field.

From this good ſtate of health, the four battalions, that had been laſt campaign in

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* MUSSCHENBROEK Inſtit. Phyſ. Cap. XL.

Zealand were an exception. For theſe were 1748. very ſubject to relapſe into irregular agues, terminating in dropſies. So that their ſick being numerous, and crouding the regimental infirmaries, (which were in the cottages near the line) they ſoon bred a malignant fever; which was from thence carried to the hoſpital, then at Ravenſtein. But there, the wards being ſpacious and well aired, tho' ſeveral of the ſick were brought in with petechial ſpots, the contagion did not ſpread farther.

On the 9th of July the camp broke up, and the troops went into cantonements. The head quarters were at Eyndhoven, with the three battalions of Guards; the reſt of the foot was quartered in the villages about; and the cavalry cantoned near Bois-le-duc.

At this time there was only about 1000 ſick in all the hoſpitals, including ſuch as had remained there from the laſt campaign and winter; but in a few days after leaving the field, a diſtemper aroſe, which ſoon became as frequent as any that had hitherto afflicted the army: and this ſeemed to be the cauſe.

This

1748. This part of Brabant is nearly as flat as any of the Netherlands; the only inequalities being ſome ſand hills and inſenſible riſings; which laſt give the advantage of a few feet in height to ſome of the villages. The ſoil is a barren ſand, and ſo little water is ſeen, that, at firſt ſight, the country is deemed dry and healthful: but the appearance deceives; for, water is every where to be found at two or three feet from the ſurface; and in proportion to its diſtance from it, the inhabitants are more or leſs free from diſeaſes. The country bordering upon the lower part of the Maes, is not only worſe in this reſpect, but, by reaſon of the inundations from the ſmaller rivers, it lies all winter under water, and continues damp throughout the ſummer. Another cauſe of the moiſture and corruption of the air, was the inundations made about the fortified towns, ſince the commencement of the war; which were particularly noxious upon letting part of the water off in the beginning of ſummer, after the preliminary articles of peace were ſigned. For theſe grounds, which were entirely covered before, being now half drained and marſhy, filled the air with moiſt and putrid exhalations; which the States being made ſenſible of, by the ſickneſs that raged in Breda and in the neighbouring villages, gave orders to let in the water anew, and keep it penned up till winter. 1748.

The ſickneſs was incomparably greater near Breda and Bois-le-duc, than at Eyndhoven, which lay at ſome leagues diſtance from the inundations, and was alſo removed from any other marſhy grounds. The moiſture, therefore, in the cantonements aroſe principally from the ſubterraneous water which exhaled through the ſand *. There were two villages near Eyndhoven, Lind and Zelſt, the one ten and the other fourteen feet above the ſurface of the water, (an extraordinary height in that country); and it was obſervable how much better the ſoldiers had their health in both theſe places, than in any other of the cantonements.

At Eyndhoven two battalions of the Guards were quartered in the town, and the third lay without, in the peaſants houſes, all within the compaſs of a mile: yet, what was remarkable, this, without the town, had always three times

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* Vid. Ch. 1. p. 3.

1748. more ſick in the Returns than either of the other two; notwithſtanding one of them had been very ſickly the year before in Zealand. Now the height of the ground being alike to all, the difference in point of health could be owing to nothing but the greater moiſture of the cottages *: for in all other points theſe corps were equal, as in diet, duty and exerciſe. A ſimilar caſe occurred in the cantonement of a regiment of foot, whereof one company being quartered in houſes that ſtood upon an open heath, enjoyed a tolerable degree of health; while the reſt that dwelt in the wood, were remarkably ſickly. And as a farther proof how prejudicial it is to have the air confined by cloſe plantations, in ſuch a moiſt country, it was obſervable, that the Dutch camp at Gilſen, bordering on our cantonements, but lying upon an open heath, preſerved a good ſhare of health, while we were at the worſt. Thus far an account of the climate: we ſhall next ſee how much the weather concurred in forming this epidemic.

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* Vid. Ch. 1. p. 4.

The ſummer had been hitherto warm, but throughout July and Auguſt, the weather was dry, cloſe and ſultry. Near the inundations, the nocturnal fogs were thick and fetid. The heats abated in the beginning of September, but till the 20th of October the weather was never cold. At that time there were days of rain, and high winds, and, towards the end of the month, ſome hard froſts: then the weather grew milder, and continued ſo, as long as the troops remained in the country. 1748.

The firſt and worſt appearance of the epidemic, was in the ſhape of an ardent fever. The men were ſeized with a violent pain in the head, and frequently with a *delirium.* If ſenſible, they complained of grievous pains of their back and loins, intenſe thirſt, a burning heat, with great ſickneſs and oppreſſion at the ſtomach; or of retchings and vomiting of bile. Others had an evacuation of the ſame by ſtool, with a *teneſmus* and pains in the bowels. This fever generally remitted from the beginning, if blood was let, and timely evacuations made of the *primæ viæ:* but if ſuch precautions were neglected, the diſeaſe went on in a continued ſhape, and was

1748. dangerous. Such was the tendency to putrefaction, that ſome had ſpots and blotches and even mortifications, almoſt always fatal.

With theſe and ſuch like ſymptoms were moſt of the fevers accompanied, during the firſt rage of the diſtemper, in thoſe cantonements that lay next the inundations: but for ſuch as lay more remote from the water, and who were only annoyed with the natural moiſture of the country and the heat of the ſeaſon, they were attacked with fewer fevers, and thoſe of a much leſs ardent, tho' of a ſimilar nature; being all either remittents or intermittents, yet ſtill of a bad kind.

Thus, tho' the ſickneſs was general, thoſe who lay near the inundations, ſuffered by far the moſt, both in the number as well as violence of the ſymptoms. The *Greys*, cantoned at Vucht, a village within a league of Bois-le-duc, ſurrounded with meadows, either then under water, or but lately drained, were the moſt ſickly. For the firſt fortnight they had none ill; but in five weeks from their arrival, they returned 150; and by the time they had been two months in that place, the number of their ſick amounted to 260;

which was above half the regiment: at the end of the campaign, they had but 30 men that had never been ill. Rothes's and Rich's dragoons, who alſo lay near the inundation, ſuffered almoſt as much. Johnſon's regiment at Nieuwland, where the meadows had been floated all winter, and were but juſt drained, returned ſometimes above half their number: and the Scotch Fuzileers at Dinther, who had a like ſituation, returned above 300 ill at a time. 1748.

What was remarkable, a regiment of dragoons cantoned at Helvoirt, a village lying only half a league ſouth weſt of Vucht, was in a good meaſure exempted from the diſtreſs of their neighbours; having remittents and intermittents of a better kind, and in a much ſmaller number. Such was the advantage of ſo ſmall a diſtance from the ſtagnating water, of the wind blowing moſtly from their quarter, and being ſituated a little higher upon an open heath.

Thus, the troops had been ſcarce a month in cantonement, when the Returns of the whole were increaſed by 2000; and they roſe afterwards much higher. For the epi-

demic

1748. demic continued throughout Auguſt, and only abated with the heats, in the middle of September. Then, indeed, the fevers began to decreaſe in number, as well as violence; the remiſſions were alſo freer: ſo that inſenſibly, with the coolneſs of the weather, this raging fever dwindled into a more regular intermittent, which entirely ceaſed upon the approach of winter. It was not a little curious to obſerve, how theſe agues declined proportionally with the withering and fall of the leaf. At that time leſs moiſture aſcends; and by the ſhedding of the leaves, the villages come to be more open and perflated; and of courſe more dry and healthful.

Through all the cantonements, the officers were much leſs ſickly than the common men; an advantage they owed to good beds, dry rooms, and a better diet.

The peaſants were alſo great ſufferers, and particularly thoſe about Breda and Bois-le-duc, where the mortality was greateſt; but in the towns there was leſs ſickneſs, and fewer in proportion died. In general, it was moſt frequent among the poorer ſort, who lay on ground-floors, lived ill, and wanted medicine:

cine: for, without artificial evacuations, nature was either able to make no cures, or but ſlow and imperfect ones. This country had not known ſuch a ſickneſs for a number of years, as the two great cauſes had not concurred; I mean inundations, with a hot and cloſe ſummer and autumn. 1748.

All this while the dyſentery was little frequent, a circumſtance that, conſidering the corruption of the humours, and their proneneſs to run off in a looſeneſs, may require ſome notice. It may be remembred, that the flux was ſaid to appear, when, after great heats, the perſpiration was ſuddenly ſtopped by wet cloaths, wet ground, or night fogs and dews: but theſe, tho' common occurrences in a camp, are rare in quarters. Add to this, that the great rage of the diſtemper is not ſo directly owing to the ſeaſon, wet cloaths, or other accidents, as to the infection ariſing from the putrid excrements of many that happen to be ill at a time. Now, in the cantonements, the men were not only leſs expoſed to wet cloaths; but when any were really taken ill from ſuch a cauſe, they were

1748. ſo much diſperſed, that the *effluvia* could not breed a contagion.

About the middle of November the troops moved from their cantonements to Willemſtad, where they were immediately put on board the tranſports; but the winds being contrary, ſeveral of the corps lay above a month at anchor, and meeting, after all, with a tedious and ſtormy paſſage, (wherein the men kept moſtly below deck) the air was corrupted, and produced the malignant fever.

This was worſe in the ſhips which tranſported the ſick from the general hoſpital at Oſterhout to Ipſwich; for, from ſome ſeeds of the diſtemper already among them, but chiefly from the ſick being crouded in the ill-aired hold of the ſhips, wherein they lay three weeks, moſt of the patients fell ill of it at ſea, or were ſeized with it ſoon after they landed. It deſerves notice, that the greateſt number, and the moſt virulent caſes of that fever, were in one of the ſhips in which there happened to be two men with mortified limbs; which accident was not only the means of ſpreading the infection more on board, but alſo in the wards they lay in after coming aſhore. 1749.

The hoſpital, prepared at Ipſwich for the reception of the ſick, was obliged alſo to admit ſeveral from the other tranſports, that, by ſtreſs of weather, put in on that coaſt: ſo that in all, there were about 400, and moſt of them ill of this malignant diſtemper. As ſo many were brought from the hoſpital ſhips in the laſt extremity, the infection and mortality were at firſt conſiderable; but by the largeneſs of the wards, and by billetting in town every man as ſoon as he recovered, (thereby removing him from new contagion, and gaining more room for thoſe who were ſtill ſick) the air was daily purified, and the diſtemper abated ſooner than could be expected. Thus the hoſpital broke up, after it had continued about three months in England.

# OBSERVATIONS

## On the DISEASES of the ARMY in

## CAMP and GARRISON.

## PART II.

### CHAP. I.

### *Of the* DIVISION *of* DISEASES *moſt incident to an* ARMY.

IN the firſt Part I have given a general account of the more frequent diſeaſes of the army, as they occurred in the courſe of the war. But as for particular deſcriptions, the cauſes, preſervatives, or cures, ſince they muſt have too much interrupted the ſeries of facts that were proper to be preſented at once, I reſerved them for different parts of this work; and ſhall therefore proceed in this,

I. To divide the diſeaſes into proper claſſes.

II. To enquire into their cauſes, as far as they depend upon the air, diet and other of the *non-naturals.*

III. To propoſe the means of prevention. And,

IV. To compare the ſeaſons with regard to health and ſickneſs; in order to compute what number of men may be relied on for ſervice, at different times of the year.

THE circumſtances of ſoldiers in time of war are different from thoſe of other people, in that they are more expoſed to the injuries of the weather, and always crouded together, whether in camps, barracks or hoſpitals: wherefore the moſt general diviſion of theſe diſtempers, may be into ſuch as ariſe from the intemperature of the weather, and thoſe from infection.

Military diſeaſes depending on the weather are reduceable to two ſorts, viz. to thoſe of winter, and to thoſe of ſummer: or, what is the ſame, to the diſeaſes of winter quarters, and of the camp. But whereas expoſitions to cold are unavoidable upon the firſt encampment,

ment, as alſo for ſome time before the army uſually leaves the field, the winter maladies beginning about the end of autumn, will not entirely ceaſe before the ſummer is well advanced: and on the other hand, as the heats of ſummer and damps of autumn diſpoſe the body to ſickneſs, the camp diſtempers are never quite over with the campaign; but continue ſome time after the troops retire into winter quarters. So that wherever we mention diſeaſes as belonging to ſummer or winter, to the camp or garriſon, we are always to underſtand them protracted in this manner.

But if the more general diſtempers of an army are not to be defined by the ſeaſons, but by the ſtate of the body that gives riſe to them; that is, not by their external but internal cauſe, we may alſo divide them into the *inflammatory* and *bilious*: the inflammatory being the ſame with thoſe of winter, and of the firſt encampment; and the bilious, no other than thoſe of ſummer, autumn, and part of what are carried from the field into winter quarters.

The moſt frequent winter or inflammatory diſorders are coughs, pleuriſies, peripneumonies,

nies, acute rheumatiſms, inflammations of the brain, bowels, and other parts, attended with a fever; leſſer inflammations without fever, and fevers of an inflammatory kind, where no part is ſo peculiarly affected as to give a name to the diſeaſe. To the ſame claſs may alſo be referred ſuch of the chronic diſtempers as have ſprung from inflammations; whereof the chief are old coughs, conſumptions, and the rheumatiſm without fever. Now all theſe diſtempers come originally from colds, or a ſuppreſſion of perſpiration, at a time when the fibres are moſt braced, the blood condenſed, and the pores of the ſkin moſt contracted.

But the ſummer and autumnal diſeaſes are of a quite different nature. In theſe ſeaſons the fibres are relaxed, the fluids are more rarified and diſpoſed to putrefaction; in which ſtate, if any ſtoppage ſhould happen to perſpiration, or to any of the excretions deſigned to carry off the more volatile or putrid parts of the blood, a fever will be raiſed, which, according to the ſeat of the humours, their acrimony, or the vent given them, will appear in the ſhape of a remitting or intermitting fever, a *cholera*, or dyſentery. Hippocrates aſcribed diſtempers of this nature to a redundance of bile; and moſt other authors to a corruption of that humour: ſo that theſe ſummer and autumnal diſeaſes have been both early and generally called *bilious*. In effect, in all hot countries, and in camps, where men are ſo much expoſed to the ſun, the gall, if not more abundant, is at this time more corrupted than uſual: and this circumſtance, if not the firſt cauſe, is at leaſt the attendant of all the ſummer or autumnal diſorders, and concurs to make them worſe.

But when the ſame cauſes operate more ſlowly, or when the diſeaſes above mentioned are but imperfectly cured, the *viſcera* will be obſtructed, or affected in ſuch a manner, as to give riſe to various chronic diſorders; ſo that conſidering not only the variety, but the frequency of diſtempers that appear at this time, we ſhall find the antient maxim, that held "the ſummer and autumn to be the moſt ſickly ſeaſons" *, not only verified with reſpect to the warmer climates, but alſo to a camp, where men are ſo much expoſed to heat and moiſture, the cauſe of putrid and contagious diſeaſes.

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* *Saluberrimum ver eſt; proxime deinde ab hoc hyems; periculoſior æſtas; autumnus longe periculoſiſſimus:* CELS. (ex HIPP. *Aphor.*) Lib. II. Cap. I.

Having laid down this general diſtinction between ſummer and winter diſtempers, it may be proper to make diviſions of both ſeaſons, in order to ſee their effects upon the health, according as either is more or leſs advanced.

When the cold weather begins, the men being thinly clad, are particularly ſubject to coughs, pleuriſies, peripneumonies and other inflammatory diſorders. The ſame continue throughout the ſpring; but as the weather is then milder, the ſickneſs is conſiderably leſs: ſo that this ſeaſon is, of all the year, the moſt healthful to an army. But as ſoon as the troops march into the field, (tho' no earlier than the firſt or middle of May) by that change, all the winter diſtempers recur, with ſeveral intermittents and fluxes of an inflammatory kind. In the beginning of June moſt of the inflammatory or winter diſeaſes diſappear, and what remain are of a milder nature: on which account, and becauſe the bilious diſtempers have yet made no progreſs, this commonly proves the healthfulleſt month of the campaign. July is alſo favourable, if the preceeding ſeaſon has not been over hot, and the men have not lain in wet cloaths, nor on wet ground; accidents that always bring on the dyſentery. But in temperate years and upon dry grounds, the diſeaſes being milder, the remitting fevers and fluxes begin only about the middle or end of Auguſt, at the time when the days are ſtill hot, but when the cool nights bring on dews and unwholeſome fogs. The dyſentery declines with autumn; but the remitting fevers continue as long as the encampment, and never ceaſe entirely till the froſts begin. Laſtly, towards the end of the campaign the cold weather renews many of the inflammatory ſymptoms; which, ſometimes by themſelves, but generally combined with the remitting fever, make the firſt diſeaſes of winter.

Tho' this be the common courſe, yet we may obſerve, that neither the *inflammatory* nor *bilious* diſtempers are ſo ſtrictly confined to their ſeaſons, but that, by various accidents, they may be found ſometimes out of their place. In theſe matters, tho' there can be no preciſion, it is of uſe to know what ofteneſt occurs. In the year 1746, when the troops encamped in the north, the *inflammatory* diſtempers, by reaſon of the coldneſs of the climate, continued throughout ſummer; and the *bilious* were either not ſeen, or were attended with ſo much inflammation, that bleeding made much the greateſt part of the cure *.

It is to be farther remarked, that as the two ſeaſons run inſenſibly into one another, there will be at the juncture a mixture and confuſion of the two kinds of diſeaſes. Thus in the end of June or beginning of July, whilſt the inflammatory diſtempers recede, the bilious are approaching; ſo that whatever cauſes bring on an illneſs, it may be either mildly inflammatory, or bilious, or have a mixture of the two. In the ſame manner, towards the decline of autumn, the bilious fevers begin to have additional coughs, ſtitches, rheumatic pains, or ſome other ſymptoms of high inflammation.

Laſtly, it is to be obſerved, that the diſtempers of winter and ſummer differ greatly as to their cure. Thus, in all winter or inflammatory diſeaſes, the principal intentions are to diminiſh the force of the blood, to thin it, and to relax the fibres; on which account, bleeding, attenuants and diaphoretics, are the chief remedies: whereas, in ſummer and autumn, while the humours are in a putreſcent ſtate, and the ſolids too much relaxed, ſuch medicines will be moſtly wanted, which clear the firſt paſſages, correct or expel the more corrupted parts of the fluids, and brace the fibres. Hence vomits, purges, ſtomachics, acids and the Bark are then of ſuch general uſe.

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* Part I. ch. 6.

Thus far we may claſs the diſeaſes depending upon the ſeaſons or weather. It remains to conſider ſuch as proceed from infection. The moſt fatal are the dyſentery and hoſpital fever; which, tho' ſometimes ariſing from other cauſes, ſpread moſt from infection. Of the like contagious nature are the ſmall pox and meaſles; but theſe having never been general, I ſhall not rank them among the diſeaſes of the army.

The *Lues venerea* and itch are infections of a different kind. The firſt not being more incident to ſoldiers than to other men, I ſhall likewiſe paſs over; but the latter being ſo frequent in camps, barracks and hoſpitals, may be reckoned one of the military diſtempers: and as ſuch ſhall be treated of afterwards in its proper place.

## CHAP. II.

## *Of the* CAUSES *of* DISEASES *moſt incident to an* ARMY.

IT appears from the firſt Part, that the more frequent diſeaſes of an army are either owing to the ſenſible changes in the air, and ſo have revolutions and periods like the ſeaſons on which they ſo much depend; or, to ſuch accidents as are almoſt unavoidable in a military life. Wherefore it will be proper to have a thorough knowledge of both theſe cauſes, in order to find out the beſt means for preventing their bad effects.

### SECT. I.

### *Of Diſeaſes occaſioned by Heat and Cold.*

GREAT heats were never ſo much the immediate, as the remoter cauſe of a general ſickneſs, by relaxing the fibres, and diſpoſing the humours to putrefaction. This was the caſe in every campaign, where it was obſervable, that no epidemic ever enſued upon the greateſt heats, till the perſpiration was ſtopt by wet cloaths, wet beds, dews or fogs; when ſome bilious and putrid diſtemper was the certain conſequence. In the campaign 1743, tho' the weather continued long extremely hot, there was no general ſickneſs till the men lay wet after the battle of Dettingen; and then the dyſentery immediately appeared *. Again in the year 1747, the ſummer was likewiſe very hot, but without any bad effects till towards the end of Auguſt; when the nights growing cool, the dews and night fogs, occaſioning a ſtoppage of perſpiration, were the means of bringing on the ſame diſeaſe †. And in the laſt campaign, tho' the heats were great, they occaſioned little ſickneſs till the troops cantoned in the marſhes; where a conſiderable degree of putrefaction and moiſture being joined, ardent, remitting and intermitting fevers, and fluxes, that became ſo general, were only the remote effects of that heat.

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* Part I. ch. iii. † Part I. ch. viii.

Nevertheleſs we muſt allow, that the heats have been ſometimes ſo great, as to prove the more immediate cauſe of particular diſorders. As when centinels were placed without cover, or frequent reliefs, in ſcorching heats; or when the troops marched or were exerciſed in the heat of the day; or when imprudently the men lay down and fell aſleep in the ſun: all which circumſtances were apt to bring on diſtempers, varying according to the ſeaſon. In the beginning of ſummer theſe errors produced inflammatory fevers, and in the end of it, or in the beginning of autumn, a remitting fever or dyſentery.

But cold is oftener the more immediate cauſe of diſeaſes, and is hurtful in two ſhapes; either when pure, or attended with moiſture: of which the laſt is the worſt. The diſtempers ariſing from cold weather, are all of the inflammatory kind; as coughs, pleuriſies, peripneumonies, rheumatic pains, and the like; together with conſumptions, which in the army are almoſt always owing to neglected coughs. The mildneſs of our winters, and the little duty the troops are put to in time of peace, make expoſitions to cold leſs frequent at home. But in war, it is to be remembered what a change a ſoldier undergoes, from warm beds and the landlord's fire, in England, to cold barracks, ſcanty fuel and ſharp winters in the Netherlands; and that without any addition of cloaths. Now how liable our men were to take cold, was ſeen in the account of the firſt garriſon ſickneſs, and of the diſeaſes in the beginning and end of every campaign.

## SECT. II.

### *Of Diſeaſes occaſioned by Moiſture.*

MOiſture is one of the moſt frequent cauſes of ſickneſs. In the account of the diſtempers of the firſt winter, we obſerved how much the men ſuffered by damp barracks; eſpecially at Bruges. The ſame remark was repeated next winter, and in the campaign 1745*. But ſoldiers are moſt liable to damps in their tents, where the ground can never be thoroughly dry, by reaſon of the conſtant exhalation, and is often very wet from rains. Theſe damps are common to all camps, and particularly to thoſe in the lower and wetter parts of the Netherlands. But obſerve, that neither canals, nor even large inundations, where the water is deep, are near ſo dangerous, or exhale ſo much noxious vapours, as marſhy grounds, or meadows that have been once floated, and but lately drained; and that fields, tho' dry in appearance, may yet be moiſt by the tranſpiration of ſubterraneous water.

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* Part I. ch. 1.

The moiſture of a ſeaſon is commonly eſtimated by the quantity of rain, whereas it depends more on the conſtancy of moiſt winds, whether they bring great rains, or none at all *: but moſt of all upon cloſe weather, eſpecially in low and woody countries. In one caſe, rains will cauſe a very dangerous moiſture of the air, when the water ſtagnates and corrupts in low grounds after land floods; but otherwiſe, in the flatteſt countries, if provided with drains, frequent ſummer ſhowers have a very ſalutary effect, by tempering the heat,

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* I made no experiments on the drineſs and moiſture of different winds in the Netherlands, but truſted to the accounts of others. The learned profeſſor Muſſchenbroek reckons all northerly winds drying, but the eaſt and north eaſt the drieſt; and the weſt and ſouth weſt the moiſteſt. *Vid. Inſtitut. Phyſic. Cap.* xlii. * Compare Ld BACON's Nat. Hiſt. Cent. viii. Exp. 786.

heat, refreſhing the ſtagnating water, and precipitating all putrid exhalations [*]. It is remarkable, that peſtilential diſeaſes have frequently occurred in dry and hot ſummers [†]: and agreeable to this, I have obſerved the moſt ſickly ſeaſons in the field have been attended with the greateſt heat, and the leaſt rain. But it will be proper to add, that tho' rains in ſummer may be in general uſeful to health, yet they will be of bad conſequence when the men are obliged to march in them, or to lie upon the ground.

Cold and moiſt air, affecting the body in winter, produced many inflammatory diſorders, and relapſes into ſuch diſtempers as the men had been ſeized with in autumn; and this effect was ſtill more manifeſt in the ſpring and beginning of ſummer, upon firſt taking the field.

But the effects of moiſt air, after great heats of the weather and rarefaction of the blood, are more pernicious. For moiſture relaxes the fibres, as well as ſtops perſpiration; and the humours being already diſpoſed to corrupt through heat, it is not ſurprizing that the dyſentery and bilious fever, both putrid diſeaſes, ſhould enſue.

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[*] Vid. Part. I. ch. i.

[†] Vid. Ld BACON's Nat. Hiſt. Cent. iv. Exp. 383. DIEMERBR. de *Peſt.* Lib. I. Cap. viii.

The too great drineſs of the air has likewiſe been mentioned by authors as the cauſe of epidemics; but, I ſuſpect, without reaſon. For, whether in winter quarters, or in camps, the ſoldiers are always expoſed to too much moiſture. And as for ſummer droughts, we are never to infer a drineſs of the air from thence; for as long as there are vegetables perſpiring, the air will ſcarce ever want humidity ſufficient for health: ſo that perhaps it is in ſandy deſarts only, we can learn what diſtempers are incident to mankind, breathing in too dry an atmoſphere.

## SECT. III.

### *Of Diſeaſes ariſing from putrid Air.*

I Shall next conſider how the air is corrupted by putrefaction, which of all other cauſes of ſickneſs is the moſt fatal, and the leaſt underſtood. This bad air, ſo deſtructive to an army, may be divided into four kinds; the firſt, which ariſes from the corrupted water of marſhes; the ſecond, from human excrements lying about the camp in hot weather, when the dyſentery is frequent; the third, from ſtraw rotting in the tents; and the fourth kind, which is breathed in hoſpitals, crouded with men ill of putrid diſtempers. Of this ſort alſo, but in a leſſer degree, is the air of full barracks, not kept clean; and of ſhips upon embarkations, when men have little room, and are long on board.

As to the firſt kind of bad air, it may be obſerved, that during the late war, the whole army never happened to encamp ſo near the marſhes, as to receive any ſenſible harm from thence; but detachments have ſuffered from this cauſe; as one did in Zealand, and another in the lines of Bergen-op-Zoom *: and in the laſt year of the war, a great part of the troops, being cantoned near the inundations of Bois-le-duc, were extremely ſickly †. Now as the exhalations from marſhes do not conſiſt of watery vapours only, but alſo of putrid *effluvia*, ariſing from innumerable vegetables and inſects that die and rot in them, it is not ſurprizing, that the diſtempers incident to ſuch as breathe that air, ſhould be of ſo putrid and malignant a nature: hence it is, that bilious fevers and fluxes are ſo frequent, infectious and dangerous in ſuch countries *.

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* Part I. ch. vii. † Part I. ch. viii.

Next to marſhes, the worſt encampments are on low grounds, cloſe beſet with trees. For, then the air is not only moiſt and hurtful in itſelf; but, by ſtagnating, becomes more ſuſceptible of corruption from the filth of a camp.

The ſecond and third kinds of bad air proceed from the privies of a camp, and from rotten ſtraw. Both theſe are always offenſive; but while the bloody flux prevails, as they contain the putrid excrements and *effluvia* of the ſick, they are then particularly infectious and dangerous. At certain ſeaſons, the moſt healthful have ſome diſpoſition to this diſeaſe, which, however, might often go off of itſelf, were it not for theſe deſtructive ſteams, which work like a ferment and favour the diſtemper.

The laſt ſource is from hoſpitals, barracks, tranſport ſhips, and, in a word, from every crouded place where the air is ſo pent up, as not only to loſe part of its elaſticity by frequent reſpiration, but alſo to be corrupted by the perſpirable matter of the body; which, as it is the moſt volatile part of the humours, is alſo the moſt putreſcent. Hence it is, that in proportion to the naſtineſs of ſuch places, the number of dyſenteries and foul ſores, but above all, of mortifications, a malignant fever is both frequent and mortal.

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* Vid. Part I. ch. vii. and viii.

## SECT. IV.

### *Diſeaſes from Errors in Diet.*

IRregularities in diet are commonly, but unjuſtly, ſuppoſed to have the greateſt ſhare in producing military diſeaſes. Was this the caſe, the changes in the weather and ſeaſons would not ſo remarkably affect the health of ſoldiers; the ſobereſt and moſt regular corps would not be ſo ſickly; different nations in the ſame camp, living variouſly, would not be afflicted with the ſame diſtempers: nor would there be ſuch an inequality in the numbers of the ſick in different years, were the greateſt part of diſeaſes owing to any other cauſes, than what have been already aſſigned All, therefore, that can be admitted on this article is, that there may be certain rules of diet, by the obſervation of which, ſoldiers may be made ſomewhat leſs liable to ſickneſs; but there can be none propoſed to make a general exemption, if the weather, ground and other circumſtances do not concur in favouring the health.

A ſoldier in time of war is, by the ſmallneſs of his pay, ſecured againſt exceſs of eating, the moſt common error in diet. The danger is on the other hand; for, when all are not obliged to eat in meſſes, ſome will be apt to beſtow their pay upon ſtrong liquors, and to ſquander away, in one day, what is but a bare maintenance for a week. But on the ſuppoſition that every man contributes his ſhare to a meſs, we may be aſſured, there can be no errors in diet of any conſequence, whilſt almoſt their whole pay is ſpent upon common food. For, as to the abuſe of ſpirits and fruit, and drinking bad water, however generally they have been accuſed, I ſhall venture to affirm, that all theſe cauſes combined never occaſioned the tenth part of any ſickneſs in the army.

Firſt, as to ſpirits it is to be obſerved, that even when drunk to exceſs, they tend more to weaken the conſtitution than to produce any of the common camp diſeaſes: or if ſome actually fall ill upon hard drinking, it is certain a far greater number are preſerved, by taking theſe liquors in moderation. Let us not confound the neceſſary uſe of ſpirits in a camp, with the vice of indulging them at home; but conſider, that ſoldiers are often to ſtruggle with the extreams of heat and cold, with moiſt and bad air, long marches, wet cloaths and ſcanty proviſions. Now to enable them to undergo theſe hardſhips, it is neceſſary they ſhould drink ſomething ſtronger than water, or even ſmall beer; which is always new and bad in camps, and even then ſcarce within the purchaſe of a ſoldier's pay.

And as to fruit, another ſuppoſed cauſe of the camp fever and dyſenteries, it muſt be no leſs innocent; ſince theſe diſeaſes being either of an inflammatory or putrid nature, cannot be owing to what is ſo much acid. Was the dyſentery the effects of eating too much fruit, ſhould we not find it a more common diſtemper among children? Nor, indeed, are the ſoldiers over fond of it; or, if they were, have they means to purchaſe it. It is ſcarce to be imagined, that when the daily pay, after ſtoppages, can but juſt purchaſe a pound of good meat, that a man will beſtow any part of it upon fruit. A few diſorderly men may rob orchards, but the dyſentery and camp fever are diſeaſes to which the moſt regular are equally ſubject. It may be farther remarked, that our worſt flux began in the end of June[*], when there was no other fruit in the country but ſtrawberries, which the ſoldiers never taſted; and that the ſame diſtemper entirely ceaſed before the firſt of October, when the grapes were ripe, and ſo plentiful in open vineyards, that the men eat what quantity they pleaſed. To theſe arguments add the authority of Sydenham, who never mentions fruit as the cauſe of ſuch dyſenteries as were epidemic in London in his time[†]: and Degnerus, another diligent obſerver, and the author of an excellent treatiſe on this diſtemper expreſly declares, that fruit had no ſhare in producing the remarkable dyſentery that raged at Nimeguen ſixteen years ago *.

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[*] Part I. ch. iii. p. 24, 25.

[†] Vid. Sect. iv. Cap. iii.

This point being then ſo plain, it may ſeem ſtrange how a contrary opinion ſhould have ſo generally gained belief, if it be not thus accounted for. The bloody flux uſually coincides with that ſeaſon in which fruit is in greateſt plenty; and as fruit is laxative and apt to gripe, it was natural to aſſign no other cauſe for the dyſentery, than eating of it immoderately; and the rather, as the true cauſe of it was ſo little obvious. But beſides, that ſtrong people are little ſubject to a looſeneſs from eating fruit, we may obſerve how different the camp dyſentery is from all other fluxes in ſymptoms, danger and cure. It may be allowed, that moſt fruits diſpoſe the body to agues, eſpecially in a moiſt country; but the remitting fever of the camp is of a different nature, as being moſtly attended with inflammatory ſymptoms and putrid bile. But granting that fruit is capable of producing both fevers and fluxes, ſuch as pre-

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* Vid. Hiſt. Dyſent. Cap. ii. § xxx.

vail in the army; yet, in ſome hundreds that have been under my care for theſe diſtempers, as I never diſcovered this to be the cauſe, I muſt conclude, that it rarely takes place, and may be well omitted in the account. At the ſame time it will be proper to obſerve, that whoever is actually under cure of a flux, or but lately recovered of it, ſhould abſtain from fruit: for, tho' the acid may be good for correcting the diſpoſition to putrefaction, yet the bowels are too much relaxed, and in too tender a ſtate to bear any ſharp, cold, or flatulent aliment. Beſides, thoſe who have lately recovered of intermittents, muſt either forbear fruit, or eat of it moderately. Nor ſhould the moſt healthful perſon deal freely in it in cloſe and marſhy countries, for this reaſon, that whatever is of a very cooling and relaxing nature, will too much weaken the habit and check perſpiration; by which means, tho' really aceſcent, it may lay the foundation of ſome putrid diſeaſe.

Laſtly, that many popular diſeaſes are owing to bad water, has been an ancient and prevailing opinion: and even Hippocrates reſolves various diſorders into that cauſe. But without entering into an enquiry about the juſtneſs of ſuch notions, I ſhall only remark, that we are not to apply what is ſaid of the water of thoſe countries, where theſe authors practiſed, to what our army commonly drank, which was plentiful and good. The only exception worth notice, was in Zealand, where the water being, indeed, leſs pure, it might concur with other cauſes in making the ſickneſs ſo general in that country *. But at all other times the water was good, and particularly in the two ſeaſons, during which the bloody flux was moſt epidemic †.

To conclude, whoever will peruſe the general account of the ſeveral campaigns, will ſee ſuch an uniformity in the riſe and periods of diſeaſes, ſo much connected with the ſtate of the air, as to be convinced, that neither the abuſe of ſpirits, or of fruit, or of drinking bad water, could have any conſiderable ſhare in producing them.

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* Vid. Part I. ch. i and vii.

† Viz. at Hanau in the year 1743, and at Maeſtricht 1747. See Part I. ch. iii and vii.

## SECT. V.

### *Of Diſeaſes ariſing from exceſs of Reſt and Motion, of Sleeping and Watching; and from want of Cleanlineſs.*

THE life of a foot ſoldier is divided between the two extremes of labour and inactivity. Sometimes he is ready to ſink under fatigue, when having his arms, accoutrements, and knapſack to carry, he is obliged to make long marches, eſpecially in hot or rainy weather: tho' the moſt frequent errors of men of that rank are on the ſide of reſt. But the cavalry have a more uniform life, having little fatigue by marches, and a conſtant, but eaſy exerciſe, both in the field and quarters, in the care of their horſes: which may be one reaſon for the better health of thoſe men.

Sometimes the ſervice requires ſuch frequent returns of duty, that the men have not time to ſleep; but ſuch occurrences are rare; and generally when ſoldiers are off duty, they ſleep too much, which enervates the body, and renders it more ſubject to diſeaſes.

It is well known how neceſſary it is to keep up the perſpiration of the body, and it is evident, how much the uncleanlineſs of the perſon will concur with other things, to fruſtrate that intention. I have obſerved in the hoſpitals, that when men were brought in from the camp with fevers, nothing ſo much promoted perſpiration, as waſhing their feet and hands, and ſometimes their whole body, with warm vinegar and water, and giving them clean linnen. So that officers judge right for the health of the men, as well as for the appearance, when they ſtrictly require the cleanneſs of their perſons and cloaths.

Under this head it will be proper to mention the itch, which is ſo general a diſtemper of the ſoldiers. This ſpreads ſo eaſily by contact of the foul perſon, or of his cloaths, that one in the ſame tent, meſs, or barrack, will quickly communicate it to the reſt. Which circumſtance, joined to the little attention men of that rank have to cleanlineſs, makes it a hard matter to keep it under, tho' the cure of each individual be eaſy.

## CHAP. III.

## *Of the general* MEANS *of preventing* DISEASES *in an* ARMY.

THO' moſt of the forementioned cauſes depend on the changes of the air, and other circumſtances, which can ſcarce be avoided; yet, as all ſuch are but relatively bad, and chiefly with regard to the ſtate of the perſon, it follows, that ſuch proviſions may be made, as ſhall prepare the body to withſtand moſt hardſhips incident to a military life. But as this maxim cannot hold ſtrictly with a multitude, it may ſtill be admitted ſo far, as a large body of men, loſing but a few by ſickneſs, may be ſaid to be healthful. I need ſcarce add, that the preſervatives from ſickneſs are not to conſiſt in medicines, or to depend upon any thing a ſoldier ſhall have in his power to neglect; but upon ſuch orders only, as, at the ſame time, that they do not appear unreaſonable, he ſhall be made to obey.

We ſhall, therefore, enquire into the means of preſervation from ſickneſs, in the order of its cauſes before mentioned; whereof the chief depending on the air, we ſhall conſider the proper precautions to be uſed: and ſhall next propoſe regulations about diet, and other material points that may fall under the direction of the officers.

## SECT. I.

### *How to prevent Diſeaſes ariſing from Heat or Cold.*

TO palliate the effects of intemperate heat, Commanders have found it expedient ſo to order the marches, that the men ſhould come to their ground before the heat of the day; and to give ſtrict orders, that none of the men ſleep out of their tents; which, in fixed encampments, may be covered with boughs to ſhade them from the ſun [*]. It is a rule of great importance to have the men early out, and exerciſed before the cool of the morning is over: for, by that means, not only the ſultry heats are avoided, but the blood being cooled, and the fibres braced, the body will be better prepared to bear the heat of the day. Laſtly, in very hot weather, it has been found proper to ſhorten the centinel duty, when the men muſt neceſſarily ſtand in the ſun.

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[*] Ne aridis, et ſine opacitate arborum, campis aut collibus, ne ſine tentoriis æſtate, milites commorentur. VEGET. *de re milit. Lib.* III. *Cap.* ii.

The preſervatives from cold conſiſt in cloaths, bedding and fuel. We have experienced the uſe of under-waiſtcoats, during the winter campaign, in Great Britain *; which ſhould teach us to make the ſame proviſion for the whole army, in any future war. None of the foreign ſoldiers are without this neceſſary part of cloathing; and, indeed, no man of the meaneſt condition abroad. Under-waiſtcoats would not only be uſeful in winter quarters, but greatly ſo on firſt taking the field; as alſo towards the end of a campaign. How much, likewiſe, watch-coats were wanted for centinel duty, appeared from the general account of the diſeaſes for the firſt winter †. A third and great article is, to provide ſtrong ſhoes for the ſoldiers; as it is ſo well known how eaſily men catch cold by wet feet.

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* Part I. ch. vi. p 50.
† Part I. ch. ii. p. 18.

The ſecond means of preſervation mentioned, was bedding; by which is underſtood a blanket for every tent of the infantry: an order which has ſcarce taken place either in the French or our army, tho' practiſed elſewhere. We have obſerved of what advantage the cloaks were to the cavalry *; how much, therefore, blankets are uſeful to preſerve the health of the foot, in the beginning and end of a campaign, is obvious. The only conſideration to be made is, whether the expence and impediment of ſo much more baggage, will over-balance that advantage, or not.

The laſt article was fuel. Of this our ſoldiers might require a greater ſupply, as being of all military people the leaſt inured to cold; but as bearing ſome degree of it in winter quarters may tend to harden them againſt an early campaign, all that is requiſite, is to give them enough for cooking their victuals, correcting the dampneſs of their barracks, and the rigour of a ſevere winter: truſting rather to their warmer cloaths and exerciſe, than to fire, for preventing diſeaſes ariſing from cold. Theſe two articles of cloaths and fuel are par-

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* Vid. Part I. ch. iii. p. 23.

ticularly recommended to the care of the officers by Vegetius*, an author who collected the maxims of the ancient Roman diſcipline.

## SECT. II.

### *How to prevent Diſeaſes ariſing from Moiſture.*

WHENEVER troops are to go into garriſon, it is the buſineſs of the quarter maſters to examine every barrack, offered by the magiſtrates of the place, and to reject all ground-floors in houſes, that either have been uninhabited, or have any ſigns of moiſture. We had a remarkable inſtance of the comparative drineſs of upper ſtories †, which are always preferable; but particularly in the Netherlands, where the houſes are without drains. But if dry habitations cannot be procured, the only reſource againſt ſickneſs from moiſture, will be an increaſe of fuel.

In the field, the beſt ſecurity is by making trenches around the tents; by which means, not only the natural moiſture of the ground is leſſened, but the rain water is intercepted, and carried off without wetting the ſtraw. This is always neceſſary whenever a camp is to remain above a night or two on the ſame ground.

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* Non lignorum patiantur (milites) inopiam, aut minor illis veſtium ſuppetat copia; nec ſanitati enim nec expeditioni idoneus miles eſt, qui algere compellitur. *De re milit. Lib.* III. *Cap.* ii.

† Vid. Part I. ch. ii. p. 16.

It is of great importance to allow the ſoldiers plenty of ſtraw, and to have it often renewed; a dry and freſh bedding being not only comfortable, but a preſervative againſt diſeaſes; and is one reaſon of the better health the ſoldiers generally enjoy upon ſhifting ground: as the damp or rotten ſtraw is then left behind. But in fixed camps, when new ſtraw cannot always be procured, when it would be uſeful, it will be proper to have the tents opened every day for ſome hours; and once in a few days, to have all the ſtraw taken out and well aired. Without ſuch a precaution it will not only grow damp, but ſoon rot and prove unwholeſome.

It will alſo be neceſſary for the officers to air their tents every day; without which every thing will contract moiſture. They are farther to be adviſed to have their bedding removed from the ground; and to uſe a bedſtead, and not lay the matraſs on the graſs. Oil-cloaths ſpread on the ground of the tent, and kept dry, intercept much of the riſing vapour. Towards the end of the ſeaſon, when the tents are cold and damp, it may be adviſeable to burn ſpirits in the evening, which warm and correct the air. But withal, the officers are to be adviſed againſt keeping their tents too cloſe, even a-nights; taking it for a rule, eſpecially when ſick, that there is more danger from breathing in a confined and moiſt air, loaded with their own *effluvia*, than from any degree of coldneſs of an open tent, with the marquiſe cloſe.

Soldiers are unavoidably expoſed to rain on marches and out-duty; and when they get wet cloaths, they are extremely liable to ſickneſs, unleſs they are allowed to cut down wood for making fires in the rear of the camp: an indulgence which I have obſerved to be of great benefit on theſe occaſions.

Where the grounds are equally dry, the camps are always moſt healthful on the banks of large rivers; becauſe in the hot ſeaſon, ſituations of this kind have a ſtream of freſh air from the water, that tends to carry off both moiſt and putrid vapours. And in cantonements, we are not only to ſeek villages removed from marſhy grounds, but ſuch as are leaſt choaked with plantations, and ſtand higheſt above the ſubterraneous waters. In moiſt countries towns are generally preferable to villages or ſingle dwellings, for the reaſons already given *.

## SECT. III.

### *How to prevent Diſeaſes ariſing from putrid air.*

HAVING, in the preceding chapter, reckoned up all the ſources of putrid air affecting an army, we ſhall now offer a few conſiderations upon the means of removing, or leſſening each in particular.

Firſt, with regard to the putrid air of marſhes, and other ſtagnating water, the ſame preſervatives mentioned under the article of moiſt air, are in a great meaſure applicable here. If the military operations ſhall oblige an army to continue long on ſuch grounds, the beſt expedient will be, to make frequent removes, and not continue fixed to one camp *;

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* Part I. ch. i. p. 4 and 5.

camp[*]; for, by ſhifting, the ſtraw will be changed, the men will have more exerciſe, and the privies will be left behind; which, in camps are more than ordinarily noxious, on account of the greater frequency of the dyſentery.

As for cantonements in marſhy grounds, if the troops muſt remain there in the dangerous ſeaſon, it will be better to float the fields entirely, than to leave them half dry: for, the ſhallower the water, the greater its corruption, and the evaporation will alſo be greater in proportion. The regiment at Helvoirt, which lay off the inundation about half a league only, was an inſtance how near troops may lie to marſhes without any remarkable ſickneſs[†]; eſpecially if the wind ſhould turn the vapours a different way. Commodore Mitchel's ſquadron in Zealand, and the healthy cantonements at Eyndhoven, Lind and Zelſt, in a ſickly neighbourhood, afforded more inſtances of the ſame nature[*]. Nay, it has been obſerved at Rome, that the ſphere of malignant vapours from the adjoining marſhes, has extended only to thoſe parts of the town which lay neareſt them, occaſioning an epidemic fever, whilſt the reſt of the city was healthful[†]. Thus, ſometimes a little remove from the marſhes may prevent a general ſickneſs; but if that is inconſiſtent with the ſervice, as happened in the campaign of 1747, when ſome battalions were ſent into Zealand; and in the ſummer following, when our troops were cantoned among the inundations, we muſt be contented to palliate what we cannot avoid. But, as this is chiefly to be done by diet and exerciſe, we ſhall poſtpone the rules, till we come to treat of thoſe articles.

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[*] Si autumnali æſtivoq; tempore diutius in iiſdem locis militum multitudo conſiſtat, ex contagione aquarum et odoris ipſius fœditate, vitiatis hauſtibus, et aere corrupto, perniciociſſimus naſcitur morbus, qui prohiberi aliter non poteſt niſi frequenti mutatione caſtrorum. VEGET. de re milit. Lib. III. Cap. ii.

[†] Vid. Part I. ch. viii. p. 81.

Whenever the bloody flux begins to ſpread, the beſt means of preſervation is to leave the ground, with the privies, foul ſtraw and other filth of the camp behind: which method is to be repeated once or twice more, or oftner, if conſiſtent with the military operations; or at leaſt till the middle of September, when the danger is in a great meaſure over. The firſt campaign furniſhed a ſtrong argument for this practice; for, the long continuance on the ſame ground at Hanau, kept up the rage of the dyſentery, which, upon decamping, ſuddenly abated *. And in the year 1745, when the diſtemper was milder than ever was known, there was not only the coolneſs of the ſeaſon to be aſſigned for a cauſe, but alſo the frequent removes during the time the army was moſt liable to the diſtemper †. But if any circumſtance ſhould make it improper to change ground, when the flux begins to ſpread, there muſt be other methods taken to check its progreſs.

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[*] Vid. Part I. ch. vii. p. 71. ch. viii. p. 77.

[†] LANCIS. de nox. palud. Effluv. Lib. II. Epid. I. Cap. iii.

In order, therefore, to preſerve a purity of air in the dyſenteric ſeaſon, let there be ſome ſlight penalty, but ſtrictly inflicted, upon every man that ſhall eaſe himſelf any where about the camp, but on the privies. Farther, from the middle of July, or from the appearance of a ſpreading flux, let the privies be made deeper than uſual, and once a day a thick layer of earth thrown into them, till the pits

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* Vid. Part. I. ch. iii. p. 28.

† Vid. Part I. ch. v.

are near full; and then they are to be well covered, and ſupplied by others. It may be alſo a proper caution, to order the pits to be made either in the front or rear, as the then ſtationary winds may beſt carry off their *effluvia* from the camp. Moreover, it will be neceſſary to change the ſtraw frequently, which is not only apt to rot, but to retain the infectious ſteams of thoſe who have been taken ill of the diſtemper. But if freſh ſtraw cannot be procured, more care muſt be taken in airing the tents and old ſtraw, as before directed.

Laſtly, when the diſeaſe begins to be frequent, the ſick are never to be ſent to one common hoſpital; at leaſt, in ſuch numbers as can vitiate the air, ſo as not only to communicate the infection to others, but to keep it up among themſelves. This rule will be ſtrongly inforced by attending to the facts mentioned in the account of the campaign in Germany *, compared with what paſſed in the ſummer 1747 †. When, therefore, the dyſentery prevails, the regimental ſurgeons are to treat the ſlighter caſes in the camp itſelf; and the reſt, as many as they can conveniently attend or accommodate, in the regimental hoſpitals; which are then, particularly, to be choſen ſpacious and airy. Barns, granaries and the like places, will allow the ſteams to diſperſe, without any danger from cold; ſince the weather is, during that ſeaſon, uſually warm. As for the general hoſpital, let it receive ſuch only as the regimental ones cannot conveniently contain, and the ſick that cannot be moved with the army. Without this diſperſing of the ſick, the general hoſpital, in bad ſeaſons, may have the charge of ſome thouſands; which cannot be well attended, but by a much greater number of hands, than has ever been allowed by the public. But were that objection removed, it would be ſtill unadviſeable to have but one common hoſpital, on account of the almoſt certain deſtruction, that would enſue, upon crouding together ſo many men, ill of a putrid diſtemper.

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* Vid. Part I. ch. iii. p. 26, 27.
† Ib. ch. vii. p. 66, 67.

Having, in the account of almoſt every campaign, mentioned the direful effects of the hoſpital fever, I need not urge the neceſſity of uſing all precautions againſt it. Without

out entering upon a particular deſcription of its nature, which is reſerved for the third Part, I ſhall at preſent only propoſe the means, whereby this diſtemper may be either kept from appearing at all, or at leaſt with ſuch a degree of contagion and danger. Theſe means ſhall be conſidered under two heads; one relating to the choice of hoſpitals, and the other to the right management of the air in them.

In treating of the bloody flux, the moſt airy and ſpacious houſes, that could be procured in the neighbourhood of the camp, were recommended for the ſick. Now the ſame means will prevent the hoſpital fever; and the rather, as the dyſentery is ſo apt to breed it. It is common on theſe occaſions to look out for cloſe and warm houſes, and therefore to prefer a peaſant's houſe to his barn; but experience has convinced us, that it is air, and not heat, that is requiſite: for this reaſon, not only barns, ſtables, granaries and other out-houſes, but, above all, churches make the beſt hoſpitals, from the beginning of June to October. Of this there was an inſtance in the campaign of 1747, when a large church at Maeſtricht was applied to that uſe;

and where, notwithſtanding above an hundred lay in it, with foul ſores, fluxes and other putrid diſeaſes, for three months together, (during the greateſt part of which time the weather was very hot) there was no appearance of this fever *. Wherefore we may lay it down as a rule, that the more freſh air we let into hoſpitals, the leſs danger there is of breeding this malignant diſtemper.

Another point to be obſerved in a fixed camp is, to have the regimental hoſpitals ſcattered, and not crouded into one village. And for the ſame reaſon, if the general hoſpital ſhould be obliged to admit a great number at a time, (which they frequently muſt do, upon the motion of the army after a long encampment) it will be proper to have the ſick diſperſed in two or three villages, rather than kept in one; tho' a narrower compaſs might be more for the œconomy of the hoſpital, as well as more convenient, and for the eaſier attendance of the ſick. The greateſt danger is from foul air, which can never be compenſated by diet or medicine. Here again, we muſt inculcate the neceſſity of carrying at all

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* Vid. Part I. ch. vii. p. 67.

times, as many of the ſick along with their regiments, as can eaſily be tranſported in waggons, for the reaſons already given. It may be neceſſary to add the following diſtinction: in the firſt part of a campaign, when inflammatory diſtempers prevail, ſuch as are taken ill are then to be left behind, as their caſes admit leaſt of motion, and at the ſame time are not infectious. But for thoſe that fall ill from the end of ſummer till the decline of autumn, as having diſeaſes of a putrid kind, but which bear motion, and generally mend upon a change of air, they are therefore rather to be carried with their regiments and diſperſed, than collected into one general hoſpital to propagate the infection.

As theſe regimental hoſpitals are of the greateſt conſequence, it would be proper to ſupply them with blankets and medicines from the public ſtores, with an allowance alſo for nurſes and other neceſſaries. Nor are they to be maintained in the field only, but alſo in winter quarters, as there will always be a great many more ſick on breaking up camp, than can be taken care of by the medical hands upon the eſtabliſhment. In the campaign

1743, about 3000 were left in the general hoſpitals; and in the year 1747, upon going into winter quarters, the returns of the ſick amounted to 4000. In the courſe of the war, one phyſician has ſometimes had the inſpection of 700 ſick at a time; in which caſe, the hoſpital might have the name of a phyſician, tho' little advantage from his attendance. But, ſuppoſe, that as many phyſicians were employed as were ſufficient for the number of caſes, and that every other part of the care was in proportion; yet the crowds, by corrupting the air, would render moſt of their labour ineffectual. This may eaſily be conceived from what has really happened; for, paſſing over the more than peſtilential mortality in the hoſpitals of the firſt campaign, and taking the reſt ſince at a *medium*, there has been commonly ſuch a degree of bad air in them, as to make the practice ſo little ſucceſsful, that by the moſt favourable computation, I have not been able to reckon leſs than one in ten that died, of all thoſe who were admitted. Beſides the better chance for good air, there is this farther advantage accruing from regimental hoſpitals, which is, that the reſpective ſurgeons are beſt acquainted with the conſtitution and diſpoſition of their patients, as well as with the whole circumſtances of their diſtempers. And as the phyſician is ſtill to be reſorted to in any caſe of difficulty, or is to make regular viſits, there can be no objection made to this method of treating the ſick, which, whenever it has been tried, has always been found much more ſucceſsful, than the common one of large general hoſpitals. To enable the ſurgeons ſtill more to attend thoſe of their own regiments, it will be neceſſary, in time of war, to give each an additional mate, as it muſt often happen that the ſick will be too numerous to be well taken care of by two hands only: beſides that, in ſickly times, one or both may be taken ill at once.

We ſhall next conſider the general hoſpitals, which are of two kinds, *viz.* the flying hoſpital, which attends the camp at ſome convenient diſtance; and the ſtationary hoſpital, which is fixed to one place. In the choice of both, it is to be earneſtly recommended to thoſe who ſhall have the inſpection, to have the wards as large and airy as poſſible; remembering, that warmth is not wanting in ſummer, and that in winter it is to be chiefly procured by fires. It will alſo be better to have the general hoſpitals in towns than in villages, as the former will furniſh larger wards, beſides more of other conveniences.

As to the diſpoſition of hoſpitals, with regard to preſerving the purity of air, the beſt rule is, to admit ſo few patients into each ward, that a perſon unacquainted with the danger of bad air, might imagine there was room to take in double or triple the number. It will alſo be found a good expedient, when the ceilings are low, to remove ſome part of them, and to open the garret ſtory to the tiles. It is incredible, in how few days the air will be corrupted in thronged and cloſe wards: and what makes it harder to remedy the evil, is the impoſſibility of convincing either the nurſes, or the ſick themſelves, of the neceſſity of opening the doors or windows, at any time, for air. I have always found thoſe wards the moſt healthful, when, by broken windows and other wants of repair, the air could not be excluded.

It is therefore probable, that when fire-places are wanting, the greateſt preſervative would be had in the uſe of Dr. Hales's *ventilator*; whereof ſome might be made for the uſe of the hoſpitals, ſmall enough to be eaſily carried about. By them we might hope for a thorough purification of the air in every ward; and working them might be a good exerciſe for the convaleſcents. As the ventilators muſt be of a ſmaller ſize, for the convenience of carriage, the ſame might be uſed on board the tranſport ſhips *.

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* I have been favoured with the following paper of directions from the celebrated inventor, whom I conſulted on this occaſion.

*Some conſiderations about means to draw the foul air out of the ſick rooms of occaſional army-hoſpitals, in private houſes in towns.*

*As it ſeems improper to draw the air out of theſe rooms, by ſmall moveable ventilators placed in the paſſages between the rooms, becauſe the foul air that is drawn out will ſoon return from thoſe paſſages into the ſick rooms; ſo the moſt likely means that occur to me for doing it, is to have a board ſcrewed faſt, and not nailed, becauſe of the noiſe, to the upper part of a window on the outſide of each room. This board to have a round hole in it, in the glaſs oppoſite to it, of a ſize to receive a trunk of a ſufficient length to reach from the window to a ſmall ventilator on the ground; through which the foul air is to be drawn out of each room, the freſh entering in at the door: this to be repeated as often in a day as ſhall be thought proper.*

*It will be requiſite to have the holes both in the board fixed over the window, and in the ſide of the ventilator made round to receive the correſponding round orifices of the trunks; by which*

In winter hoſpitals, the wards are to be warmed by chimneys, and never by ſtoves; for, tho' the latter may warm a large ward better, and at a leſs expence, yet by ſcarce making any draught of air, it will be apt to increaſe its putrid quality; whereas a fire, kept up in a chimney, acts like a conſtant ventilator.

If ventilators are uſed, other precautions will be leſs neceſſary; but if they are not, we muſt have recourſe to ſuch other things as may help

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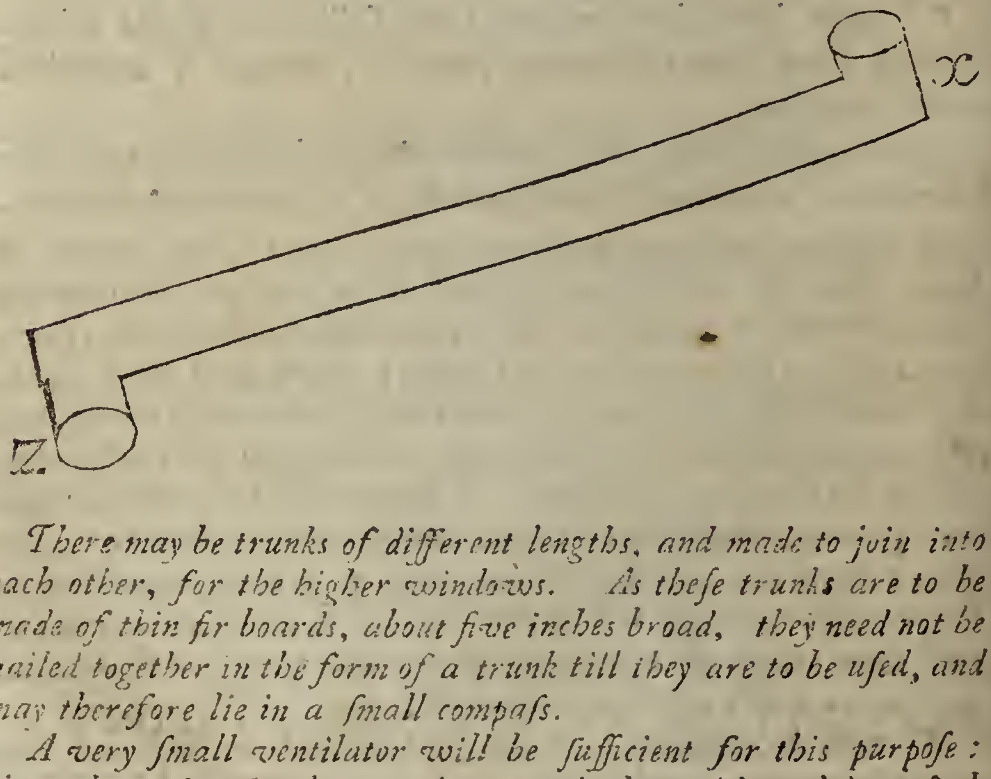
*means the ſame trunk may ſerve for windows of different heights, by being placed more or leſs obliquely, thus:* viz. *x, the end at the window; z, the end fixed to the ventilator.*



*There may be trunks of different lengths, and made to join into each other, for the higher windows. As theſe trunks are to be made of thin fir boards, about five inches broad, they need not be nailed together in the form of a trunk till they are to be uſed, and may therefore lie in a ſmall compaſs.*

*A very ſmall ventilator will be ſufficient for this purpoſe:* viz. *about five feet long, and twenty inches wide and deep, ſuch as is deſcribed in my ventilator book, fig.* 6.

to purify the air. Among theſe, the moſt common is burning frankincenſe, the wood or berries of juniper; or ſome other reſinous or antiſeptic vegetable. The ſteams of vinegar are often recommended on theſe occaſions, and probably will beſt anſwer the purpoſe; but being not ſo commodiouſly diffuſed as other things that burn, they have not hitherto been tried. The burning of ſulphur or gunpowder is alſo mentioned by authors, as very uſeful in ſuch caſes; and from their acid ſteams, they ſeem likely to anſwer the end.

## SECT. IV.

### *How to prevent Diſeaſes by proper Diet.*

IT is to be obſerved, that no orders will be able to reſtrain ſoldiers from eating and drinking what they like, if they have money to purchaſe it. Wherefore, a fundamental rule, and, indeed, almoſt the only one needful, is to oblige the men to eat in meſſes; by which means we may be aſſured, that the beſt part of their pay will be beſtowed on wholeſome food: in as much as what is agreeable to the majority, has the beſt chance for anſwering that character. And it will be ſufficient to truſt the choice to their taſte and experience, without ſearching too ſcrupulouſly into the nature of particular aliments, which even with more delicate people ſeldom offend ſo much in kind as in quantity. The greateſt impediment to meſſing, are the wives and children, which muſt often be maintained on the ſoldiers pay: in ſuch circumſtances, it is not improper food, but the want of it, that may endanger a ſoldier's health. The meſſing being eſtabliſhed, there remains only to ſee that the men be well ſupplied with bread; and that the markets be ſo regulated, that the traders have encouragement to come to the camp, and the meſſes have good proviſions at a moderate price: in particular, vegetables, which, in the hot months, ought to make a great part of the diet. Tho' the pay of a Britiſh ſoldier is greater than that of other troops abroad, his œconomy is leſs; ſo that after paying his proportion in the meſs, there is little danger of his having wherewithal to make a debauch. How far ſome quantity of ſtrong liquors are uſeful, has been already ſhewn *.

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* Ch. ii p. 107.

As the heats of ſummer generally tend to produce diſeaſes in autumn, by diſpoſing the humours to corruption, it were to be wiſhed, that during that ſeaſon the diet was ſo ordered, that this tendency was ſomewhat corrected. It may deſerve our notice, of what uſe the Romans thought vinegar, when they conſidered it as one of the moſt indiſpenſible proviſions of an army *. Now whether this was uſed by way of ſeaſoning to their victuals, or mixed with water and drank whilſt they were hot or feveriſh, it muſt have had a good effect in correcting the too great heat and putreſcency of the blood, during the warm weather. It might, therefore, be worth while to revive the practice, by giving an allowance of vinegar throughout the ſummer; and probably the ſoldiers might be induced to take it, after finding it ſo uſeful in abating heat and thirſt. Vinegar-whey, already known in the hoſpital, is an excellent cooler in inflammatory fevers, and is much liked by the patients: but the ſureſt way of making ſoldiers take an

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* Hyeme lignorum et pabuli, æſtate aquarum vitanda eſt difficultas. Frumenti vero, vini, *aceti*, nec non etiam ſalis omni tempore vitanda neceſſitas. VEGET. de re milit. Lib. III. Cap. iii.

acid, would be by mixing either vinegar or ſpirit of vitriol * with ſuch a proportion of ſpirits, as may be thought a proper allowance for each man, by way of preſervative againſt diſeaſes, when any detachments from the army ſhall be ſent into Zealand, or the more marſhy parts of Brabant or Flanders, during the ſickly ſeaſon.

Pork has ſometimes been forbid in camps: being looked upon as unwholeſome food. Sanctorius obſerves, it retards perſpiration; and as it corrupts ſooner than beef or mutton, it may be preſumed to afford a leſs proper nouriſhment than either, when there is danger from putrefaction. It is ſuſpected alſo, that the meat is generally too little blooded, and thereby more diſpoſed to corrupt, and to concur with other cauſes in breeding putrid diſeaſes.

In eſtabliſhing the meſſes, there may be ſome regulations made with regard to the uſe of ſpirits, whether by ſtoppages on the pay or otherwiſe. This is already practiſed in the navy, and, probably, for the ſame reaſons for which it might ſometimes be proper here; ſince, in ſhips, men are alſo liable to diſtempers ariſing from a moiſt and corrupted air.

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* Vid. Dr. HUXHAM's Eſſ. on Fev. Append.

As for the officers, whether in camp or in cantonements in a moiſt country, they are expoſed, tho' in a leſſer degree than the common men, to the ſame diſeaſes of the ſeaſon and climate, and therefore muſt be on their guard. Their chief rule in diet, in ſickly times, is to eat moderately, avoiding all ſurfeits and indigeſtion *. Wine is neceſſary; but exceſs in every thing is, at this time, particularly dangerous. I ſhall conclude with that prudent rule of Celſus, for preſerving againſt diſeaſes ariſing from a moiſt and corrupted ſtate of air: *Tum vitare oportet fatigationem, cruditatem, frigus, calorem, libidinem* †.

## SECT. V.

### *How to prevent Diſeaſes ariſing from errors in exerciſe.*

THE greateſt fatigue a ſoldier undergoes, is in making long marches, eſpecially in hot or rainy weather. When the ſervice requires it, ſuch hardſhips muſt be endured; but

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[*] Si qua intemperantia ſubeſt, tutior eſt in potione quam in eſca. CELSUS, de med. Lib. I. Cap. ii.

[†] Lib. I. Cap. x.

but they will be attended with leſs ſickneſs, if care is taken to ſupply good proviſions, and plenty of dry ſtraw. At other times, when diſpatch is not required, ſhort marches before the heat of the day, with proper halts, are ſo far from harraſſing the troops, that nothing can be more conducive to preſerve their health: Now in fixed camps, as there is always more ſickneſs from inactivity than from fatigue, it will be altogether neceſſary to make proper regulations about the exerciſe on thoſe occaſions; and the rather, becauſe our ſoldiers, left to themſelves, are naturally too indolent.

The exerciſe of a ſoldier may be conſidered under three heads; the firſt relates to his duty, the ſecond to his living more commodiouſly, and the third to his diverſions.

The firſt conſiſting chiefly in the exerciſe of his arms, will be no leſs the means of preſerving health, than of making him expert in his duty [*]; and frequent returns of it, early and before the ſun grows hot, will be more advantageous than repeating it ſeldom, and ſtaying too long out at a time. For, as a camp affords little convenience for refreſhment, all unneceſſary fatigue is to be avoided.

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[*] Rei militaris periti, plus quotidiana armorum exercitia, ad ſanitatem militum putaverunt prodeſſe, quam medicos.—ex quo intelligitur quanto ſtudioſius armorum artem docendus ſit ſemper exercitus, cum ei laboris conſuetudo et in caſtris ſanitatem, et in conflictu poſſit præſtare victoriam. VEGET. de re milit. Lib. III. Cap. ii.

As to the ſecond article, cutting boughs for ſhading the tents, making trenches round them for carrying off the water, airing the ſtraw, cleaning their cloaths and accoutrements, and aſſiſting in the buſineſs of the meſs, are all things which, as they muſt be ſtrictly executed by orders, ought to be no diſagreeable exerciſe to the men, for ſome part of the day.

Laſtly, as to diverſions, ſince nothing of that ſort can be inforced by orders, the men muſt be encouraged to it, either by the example of their officers, or by ſmall premiums to thoſe who ſhall excel in any kind of ſports, which ſhall be judged moſt proper for anſwering this purpoſe. But herein ſome caution is neceſſary with regard to exceſs, becauſe our common people, generally, obſerve no medium between their love of eaſe and purſuing the moſt violent exerciſe. And however neceſſary motion may be to troops in fixed camps, we are to beware, on the other hand, of giving them too much fatigue, eſpecially in hot weather and in times of ſickneſs: and above all, in expoſing them to wet cloaths, which, as has been fully ſet forth, is the moſt frequent immediate cauſe of camp diſeaſes.

## CHAP. IV.

### *The* SEASONS *compared with relation to* HEALTH.

IN the beginning of every campaign we are to expect, for the firſt month at leaſt, that the *Returns* will be conſiderably higher than if the men were to remain in quarters. The earlieſt encampment began on the 8th of April *, and produced ſuch a number of ſick, that in a month's time the Returns amounted to $\frac{1}{27}$th part of the whole. In the year 1745 the campaign was opened on the 25th of April, and in 1747 on the 23d of the ſame month, both in the Low Countries: but in the year 1746 the troops encamped on the 23d of April in the north of Scotland; which, conſidering the latitude and openneſs of the country, may be reckoned the earlieſt of all.

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* Vid. Part. I. ch. viii.

And from all theſe inſtances there is reaſon to believe, that the proportion mentioned will generally hold, when the army is to take the field ſo ſoon.

But if the troops were to continue in quarters till the middle of May, the ſickneſs of the firſt month would be conſiderably leſs, tho' perhaps not ſo much as might be expected. Thus, in the firſt campaign, our troops encamping on the 17th of May*, had in the hoſpital, after the firſt month, about $\frac{1}{31}$ part of the whole number: a proportion, however, we cannot offer as a general one; becauſe the men had juſt then made a long march, and it was their firſt campaign. The next year, when the troops marched out on the 13th of May, after a month's encampment, there was found in the hoſpitals about $\frac{1}{40}$th part only: but as the weather was mild, and other circumſtances favourable, the proportion might perhaps be reduced in common years to $\frac{1}{30}$th: ſo that, *cæteris paribus*, the number of the ſick will be, after the firſt month, about $\frac{1}{4}$th greater when the army encamps in the middle of April, than when it takes the field a month later.

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* Part I. ch. ii. p. 20.

After the firſt fortnight or three weeks of the encampment, the ſickneſs daily declines, as the moſt infirm are already in the hoſpital, the reſt more hardened, and the weather is daily growing warmer. This healthy ſtate continues throughout the ſummer *, unleſs by ſome extraordinary expoſition to rain, the men get wet cloaths or wet beds; whereupon, in proportion to the preceding heats, a greater or leſſer degree of the dyſentery will appear.

The great ſickneſs commonly begins about the middle or end of Auguſt, whilſt the days are ſtill hot, but the nights cool and damp with fogs and dews: then, if not ſooner, the dyſentery generally prevails; and tho' its violence is over by the beginning of October, yet the remitting fever gaining ground, continues throughout the reſt of the campaign, and never entirely ceaſes till the froſt begins.

The ſickneſs in the beginning of the campaign is ſo uniform, that the number of thoſe that are to fall ill before the end of ſummer, may be nearly predicted: but for the reſt of the ſeaſon, as the diſtempers are then of a contagious nature, and depend ſo much upon the heats of ſummer, the fogs and rains, it is

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* That is, until the middle of Auguſt.

impoſſible to compute how many may fall ſick from the beginning to the end of autumn. At the end of the campaign in Germany, the number of the ſick was to that of the men in health as 3 to 13. In 1747, when the troops left the field, the ſick made about one-fifth part of the whole: but if we conſider, by itſelf, the detachment ſent that year into Zealand, this proportion was juſt inverted; for the men in health were to the diſeaſed, only as one to four. Upon cloſing the campaign in 1744, tho' half of the army were new men, yet we had but 1 in 17 ſick; and in the year following, which was remarkable for health, there was not above 1 in 26 ill: but in both thoſe years the troops returned into winter quarters ſooner than uſual. I have obſerved, that the laſt fortnight of a campaign, if protracted till the beginning of November, will be attended with more ſickneſs than the firſt two months of the encampment.

If, therefore, campaigns are to laſt ſix months, it imports much as to health, whether they begin early or late. For, tho' one would believe it ſafer for troops to delay encamping till the beginning of May, and to ſtay out till the end of October, yet experience ſhews it is more conducive to health to go out a fortnight ſooner, in order to return ſo much the earlier into winter quarters.

We have already obſerved, that the remitting fever does not always terminate with the campaign, but continues, in quarters, till the froſt begins; and from that period till the opening of the next campaign, that there are no other acute diſtempers, excepting ſuch as are occaſioned by colds*. But as to chronic diſeaſes, ſince the preceding autumn has laid ſo large a foundation for them, a variety of ſuch caſes will always occur; and thoſe generally from obſtructed *viſcera*. Yet, upon the whole, the *returns* of the ſick will ſenſibly decline; in ſo much, that if the troops are but tolerably accommodated, and the foregoing autumn has not been unuſually bad, we may expect they will take the field next ſpring, without above one man in 40 remaining in the hoſpitals.

Winter expeditions, tho' ſevere in appearance, are attended with little ſickneſs, if the men have good ſhoes, quarters, fuel and proviſions. Of this we had one proof in the march into Germany, and another in that to the north, in the year of the rebellion. But long marches in ſummer are not without danger, unleſs they are made in the night, or ſo early, that they may be over before the heat of the day.

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* Part II. ch. i. p. 90.

Whatever numbers fall ſick in the camp, (eſpecially after the decline of ſummer) ſo as to be confined for any time in an hoſpital, they are never to be relied upon for ſervice that ſeaſon; for, as they have been ſo much weakened by their diſtemper, and lying warm, they will ſurely relapſe whenever they return to their duty. It would therefore be of more advantage to give convaleſcents ſome employment in garriſons, during the remainder of the campaign, or at leaſt, till they have time fully to recover; for which end, hoſpitals have neither accommodation nor good air. And it will alſo tend to prevent diſeaſes (whenever it can be conveniently done) to ſend the ſickly or unſeaſoned corps ſomewhat earlier than the reſt into winter quarters.

Having mentioned the ſeaſoning of troops, it may be proper to add the following caution, as a miſtake may be made ſo eaſily. By well-ſeaſoned troops are commonly underſtood, ſuch as having gone through much fatigue, are therefore ſuppoſed beſt qualified to bear more. But in this we may be deceived; becauſe ſuch corps as have been rendered ſickly by ſervice, will never afterwards be ſtrong or fit for new labour, till all the infirm are dead or diſmiſſed. For, as ſoldiers in time of war, are not only ſubject to violent diſorders, but have little time or convenience for recovery, if once they fall ill, it is odds but their conſtitution will be ſo weakened, as to make them afterwards more liable to diſeaſes. I ſhall mention two inſtances: in the year preceding the war, our troops having encamped on Lexden heath, near Colcheſter, and ſtaid late out, returned ſickly into quarters. Now it was obſervable, that thoſe who recovered and went over to Flanders, were the firſt ſick in the garriſons; and the ſame men, with others who were taken ill in the Low Countries, were alſo the firſt that were ſeized with diſtempers in the cantonements, and afterwards, when the army took the field. So that thoſe regiments were never healthful till they loſt all the men of broken conſtitutions; which, indeed, in a great meaſure happened during the courſe of the firſt campaign. The ſecond inſtance, was the detachments ſent to Zealand and Bergen-op-Zoom, in the year 1747; which ſuffering greatly by the diſeaſes of the country, the ſame battalions in the beginning of the enſuing campaign were remarkably more ſickly than any of the reſt. But whereas the ſecond campaign, tho' ſucceeding the ſickly one in Germany, was, nevertheleſs, very healthful, and as the third was ſtill more ſo, ſome may thence infer, that troops were only to ſuffer the firſt year; and being then ſeaſoned, were afterwards to go unhurt through the uſual military fatigues. To this we anſwer, that, beſides that the weather was extremely favourable during the ſecond and third campaigns, and that the camp broke up early in both, it muſt be remembered, all the corps, which had been in Germany, had almoſt entirely loſt their ſickly men; ſo that thoſe who took the field next year, were either the old ſoldiers, who had never been ill, or were recruits, *additionals* and new regiments which came then from England: theſe, therefore, holding well out, were rather a proof of what was advanced above. And if the third campaign was ſtill more healthful than the ſecond, we may obſerve, that the army happened then to be in the beſt plight; conſiſting altogether of freſh ſoldiers, or of other men who were ſo far well ſeaſoned, that they had been, indeed, in the field, but meeting with good weather and a ſhort campaign, had never been ſickly. But as a clear proof that the degree of health and hardineſs of troops is not according to the time they have ſerved, during the laſt two years of the war, the ſick were, in proportion, as numerous as they had been in the two firſt. And what happened in the cantonements in Dutch Brabant, during the laſt campaign, ſhews, that there can be no ſeaſoning at all againſt the influence of the moiſt and corrupted air of marſhes.

The whole amounts to this; conſidering all the hardſhips and expoſitions to ſickneſs attending the eaſieſt ſervice, thoſe troops will be beſt ſeaſoned to go through the difficulties of a ſecond campaign, whoſe health has been moſt preſerved in the firſt.

# OBSERVATIONS

## On the DISEASES of the ARMY in CAMP and GARRISON.

## PART III.

### CHAP. I.

### *Obſervations on the* INFLAMMATORY FEVERS *in general.*

HAVING laid down the diviſion of diſeaſes moſt incident to an army, with their remoter cauſes and means of prevention, I ſhall proceed, in this Part, to offer ſome practical obſervations upon each diſtemper, in the order they were propoſed *; and therefore I ſhall begin with ſuch as depend chiefly upon inflammation.

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* Vid. Part II. ch. i.

But whereas inflammatory fevers are every where common, and a ſubject ſo much handled by authors, I ſhall not enter into a particular account of any, but make a few remarks on ſuch as moſt frequently occur in military hoſpitals.

Upon firſt taking the field, as well as during the winter, pleuriſies and peripneumonies are the moſt common forms of the inflammatory fever; and next to them, fevers attended with rheumatic pains. The inflammation turns alſo upon the brain, liver, ſtomach, and other *viſcera*. Univerſally, the fever taking its riſe from a ſtoppage of perſpiration, or whatever is the primary effect of cold, by firſt inflaming any of theſe parts, becomes afterwards ſymptomatic of that obſtruction.

Sometimes we can perceive no part more affected than another, and only ſome general ſymptoms of inflammation. The diſtemper is then called ſimply an inflammatory fever; tho' if it continues beyond two or three days, it is probable that ſome one of the more *indolent* parts will then be conſiderably obſtructed. This ſort is moſt common after

ter the weather begins to be warm. But no inflammatory fever is ever ſeen ſingle in the end of ſummer, or in autumn; at which time, expoſitions to cold, or moiſture, produce fevers and fluxes of a bilious kind, where the inflammation is often the leaſt part of the diſeaſe.

For, after the ſummer ſolſtice, the fevers, with a leſs degree of inflammation, tend moſtly to remit, and are attended with leſs ſizy, but more putreſcent blood. But towards the end of the campaign, when the weather grows cold, the more violent inflammatory ſymptoms are joined; ſo that the fevers may be ſaid, at that time, to depend on two different cauſes.

Among the mixed inflammatory fevers, may be likewiſe reckoned the vernal intermittents, which upon the firſt encampment, not only ſeize thoſe, who have had agues in the preceding autumn, but other men, who never had any. Theſe are the more carefully to be diſtinguiſhed from true agues, as they are to be treated chiefly by bleeding and other antiphlogiſtic remedies. If the Bark is given before the blood has loſt its ſizineſs, the diſtemper will either be changed into a continued fever, or ſtopt for a while, to recur with worſe ſymptoms.

The inflammatory fevers of an army differ from moſt others, in being more violent, and more frequently attended with a *diarrhœa.* The ſeverities of the weather, to which a ſoldier is peculiarly expoſed, his backwardneſs to complain of the firſt ſymptoms, his rough lying when he is taken ill, or his being carried to an hoſpital at ſome diſtance, account ſufficiently for the firſt. And it is either the want of a bed, or the lying cold, or drinking improper liquors, when firſt taken ill, that are the cauſe of the flux.

As bleeding is the moſt indiſpenſible remedy in the cure of all inflammatory diſeaſes, it is chiefly by delaying this too long, or not repeating it, that colds end in dangerous fevers, rheumatiſms or conſumptions. As a ſoldier applies firſt to the ſurgeon of his regiment, on him it chiefly depends to prevent many diſorders by timely bleeding. In general, young practitioners are apt to be too ſparing in letting blood; and many lives are loſt by deferring the operation for a few hours. But the ſurgeon may be aſſured, that a ſoldier will never complain of a cough or pains with inflammatory ſymptoms, wherein bleeding is not proper, or at leaſt not hurtful. From the ſizineſs of the blood, and the continuance of the complaints, he is to judge of the neceſſity of repeating it, which, in caſe of a ſtitch or difficult breathing is never to be delayed. A ſoldier, who has nothing to live upon but his pay, in a foreign country, has not the means of breeding too much blood; and tho' ſtrong, not being plethoric, bears theſe repetitions better than the loſs of a large quantity at once. I have generally preſcribed, in inflammatory caſes, from twelve to fifteen ounces for the firſt bleeding, and ſomewhat leſs for all the reſt. When it is neceſſary to exceed this quantity, it may be proper to follow Celſus's rule; in minding the colour of the blood whilſt it flows, and when it is of a blackiſh caſt (which it always is in difficult breathing and great inflammations) to let it run till it becomes more florid *. In all caſes where plentiful bleeding is indicated, it is beſt to do it in bed, to prevent faint-

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* De med. Lib. II. cap. x.

fainting; and we may obſerve, that a perſon will bear the loſs of a much greater quantity of blood, if the ſtream is ſmall, than by a large orifice; which ſome have thought neceſſary for making a more ſpeedy revulſion.

Another prevention conſiſts in an early ſweat; for which the beſt medicine is the *Hauſt. Diaphoret. Pharmacop. Pauper. Edinb.* If the volatile *Sal Ammoniacum* is wanting, it may be ſupplied by the *Sal. C. C.* or by the ſpirit, if made without quick-lime. It is uſual to give the *theriaca*, or ſome other warm medicine, for this purpoſe; but a'l ſuch increaſe the fever, if they fail in bringing out the ſweat; whereas the ſaline preparations operate without heat. The *theriaca* is rendered more ſudorific and leſs narcotic, by adding ten grains of *Sal. C. C.* to a common doſe, and promoting the ſweat by a large draught of vinegar whey. But as to the method of preventing fevers, it will fall more in the way of the regimental ſurgeons, than of the phyſicians attending the hoſpital, who rarely ſee the patient, till either the fever is quite formed, or ſo far advanced as not to be removed by ſudorifics.

If, therefore, the *cold*, or feveriſh diſorder has been of two or three days ſtanding, it is to be treated by bleeding only, and ſuch diaphoretics as are of a cooling, or at leaſt little heating nature. Of this kind are the common nitrous medicines, and the ſaline draught of Riverius. But nothing is ſo efficacious in this way as the *Spiritus Mindereri*[‖]; the internal uſe of which was firſt introduced by Dr. John Clerk, a celebrated phyſician at Edinburgh, from whom I had it[*]. Nitre has been

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[‖] Pharmacop. Edinburgenſis.

[*] As it may give ſatisfaction to the reader, to have the Doctor's obſervations upon the effects of this medicine in various caſes, I ſhall ſubjoin his own expreſſions, in an extract of a letter he favoured me with on that ſubject. *In relation to the* Spiritus Mindereri, *I never gave above half an ounce for a doſe. When intended to promote a* diureſis, *I give that quantity twice a day mixed with an equal portion of* Syr. de Alth. *and find it ſeldom fail. But in a dropſy, I more commonly make uſe of the* Julap. Diuretic. Pharmacop. Pauper. Edinb. *I have ſometimes added the* Sal Succini, *when I was ſure of its being genuine; but that is rarely to be found. For that reaſon it is left out of the* Pharmacop. Pauper. *and the ſpirit put in its place, which has the ſame* ratio *to the ſalt, that the ſpirit of hartſhorn has to its ſalt; tho' till then not being in uſe, it was thrown away as of no value. When I give the* Spiritus Mindereri *to promote a* Diaphoreſis, *I always add a ſmall quantity of* Sal. Cornu Cervi; *to give it the alcaline caſt, as in the* Hauſt. Diaphoretic. Pharmacop. Pauper. *When I deſign to provoke plentiful ſweating, as in rheumatic diſeaſes, I uſe the* Julap. Diaphoretic. (Pharmacop. Pauper.) *two ſpoonfuls every hour, or hour and an half, till the ſweat breaks out; repeating it* pro re nata, *when the warm diluting liquors are not ſufficient to keep*

been given from about ten to fifteen grains every ſix hours. Larger doſes generally diſagree with the ſtomach, and even theſe will be ſometimes too great. I have alſo followed the common practice in joining the *teſtacea* to the neutral ſalts, but without any particular attention at firſt to their effects; but having ſince diſcovered a ſtrong ſeptic quality in all thoſe ſubſtances, in experiments out of the body, it was natural to conclude they muſt exert a like power when taken by way of medicine *. And this perhaps would be oftener ſeen, were it not for the quantity of acids, uſually given in acute diſeaſes; in which caſe not only the ſeptic nature of the *teſtacea* may be deſtroyed, but the acid neutralized, and thereby rendered more diaphoretic. The putrefying quality of theſe powders is alſo corrected by the *Contrayerva* root, and there-

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*keep it up. I have given of the ſpirit, in this manner, about two ounces, and ten grains of the* Sal. C. C. *in the ſpace of four and twenty hours. In topical inflammations I give it the acid caſt, by mixing with it an equal quantity of* Acetum Scilliticum. *I have often given it ſo in pleuriſies and peripneumonies. I underſtand that ſome of my brethren uſe this form only. Of all neutrals, I take* Sal Ammoniacum crudum *to come neareſt the* Spirit. Minderer. *I uſe ſometimes the* Bol. Diaphoret. Pharm. Pauper. *but I do not find it near ſo efficacious as the julep.*

* Append. Paper III. exp. xxiii.

fore with that addition they are leſs liable to exception †.

It will be neceſſary to diſtinguiſh theſe fevers into two ſtages; the firſt, in which the pulſe is hard, and it is proper to bleed; and the ſecond, when, the inflammatory ſymptoms ſtill remaining, the pulſe is too low for that evacuation. In this laſt ſtate bliſters are the chief remedy, and which, unleſs in a few caſes, to be mentioned hereafter, are never to be uſed ſooner. If bliſters are made large, it is better to apply them gradually, than many at a time. It is uſual to begin with the back, and if neceſſary to apply them next day to the legs or thighs, reſerving the arms laſt, that the patient may be ſo much the longer conveniently moved. In great lowneſs attended with a *delirium*, ſinapiſms applied to the ſoles of the feet, have frequently more efficacy than bliſters in raiſing the pulſe, and relieving the head. For this purpoſe I have uſed both the *formulæ* in the Edinburgh diſpenſary.

It may be a proper caution in theſe hoſpitals, where the air is always to be ſuſpected, to begin to provide early againſt its corruption. For which reaſon, as ſoon as the inflammation begins to abate, or the pulſe to ſoften, I found it adviſeable to give the diaphoretic powders in the following manner:

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† Append. Paper IV. exp. xxvii.

℞ *Pulv. Contrayerv. comp.* ℈i. *Nitri puri* gr. x. *Camphor. gr.* ij. *vel* iij. *M. F. Pulv. ſexta quaque hora repetend.*

Or,

℞ *Aq. fontan.* ℥iv. *Aq alexeter. ſpir. cum Acet. Julep. e Camphor. āā.* ℥iß. *Pulv. Contrayerv. comp.* ℈iv. *Nitri puri* ℈ij. *Syr. e Cort. Aurant.* ʒvi. *M. Cap. ſexta quaque hora cochl.* iij. *vel* iv.

The camphire ſeems to anſwer beſt when thus diſſolved; and I have found it moſt efficacious in ſuch ſmall doſes, for abating inflammation and nervous ſymptoms; and alſo for promoting a gentle *diaphoreſis.*

Towards the *criſis*, or in the declenſion of the fever, a little wine is to be added to the panado, or given in ſome other ſhape. In *lowneſs*, I have uſed ſome common cordial; but in great *ſinkings*, I have added half a drachm of ſalt of hartſhorn to eight ounces of that mixture.

Thirſt is moderated by acidulating the barley-water or ſage tea with ſpirit of vitriol, or with lemon juice; but by nothing ſo much, and ſo agreeably, as by allowing the patient ſome ſlices of an orange.

If the body has been coſtive before the diſeaſe, it is proper to open it by a laxative, after bleeding; but if not, it is ſufficient to uſe clyſters, when ſtools are wanted. After recovery, ſome lenient phyſick is generally requiſite, for preventing a too haſty repletion, incident to convaleſcents, upon indulging their appetite: otherwiſe purgatives ſeem at this time to be unneceſſary.

Unleſs upon ſome particular indication, vomits are not to be given, and at any rate they are unſafe but in the beginning of the diſeaſe. This caſe may be excepted; when after a reſolution of a peripneumony, the patient is ready to be ſuffocated by a tough defluxion; then, indeed, a gentle vomit is ſometimes the beſt expectorant.

There is no caution more neceſſary to a young phyſician, than to abſtain from all opiates throughout the diſeaſe; however much the patients complain of pain or watchfulneſs. There may be ſome exceptions, but they are few and hard to define. It will be ſafeſt to make none beſides the following one. If the fever is accompanied with a *diarrhœa*, not critical, the looſeneſs is to be gradually checked by *diaſcordium* *, after giving rhubarb, and endeavouring to turn the humours to the ſkin by the uſual diaphoretics, (omitting the nitre) with the uſe of the white decoction for common drink. Some low and nervous fevers are frequently attended with a looſeneſs, which, tho' not immediately critical, can never be ſtopped without danger: but ſuch rarely occur in the hoſpital, and do not properly belong to this claſs of diſeaſes.

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* See the *Formula*, Part III. ch. vi. ſect. 4.

CHAP.

# CHAP. II.

## *Obſervations on particular* INFLAMMATIONS.

### *Of the* PHRENITIS.

THE *phrenitis*, or inflammation of the membranes of the brain, conſidered as an original inflammation, is properly a ſummer diſeaſe, when men are expoſed to the ardour of the ſun, and eſpecially whilſt aſleep and in liquor. But a ſymptomatic *phrenitis* is one of the moſt general inflammatory diſorders, is confined to no ſeaſon, and accedes indifferently to the bilious, malignant or inflammatory fever. This is more common in military hoſpitals than elſewhere, on account of the violence done to all fevers, when the ſick are carried in waggons from the camp to an hoſpital, where the very noiſe, or light alone, might be ſufficient, with more delicate natures, to raiſe a phrenſy.

An original *phrenitis* chiefly requires ſpeedy, large and repeated bleedings; and the relief is believed to be the more certain, if the blood can be taken from the jugular. I have never adviſed cutting the temporal artery, as I found ſuch reſource in applying ſix or ſeven leeches to the temples *. The benefit ariſing from thence, may be compared to the effects of a plentiful hæmorrhage by the noſe. The reſt of the cure conſiſts in bliſters, and things common to other inflammatory fevers.

The cure of the ſymptomatic *phrenitis*, if the pulſe can bear it, is alſo by opening a vein; but if this cannot be done by reaſon of great *lowneſs*, it is then to be attempted by leeches and bliſters. It is uſual to begin with bliſtering the head, but in military hoſpitals, I found it more convenient to leave that for the laſt; becauſe the barbers are careleſs, and in cutting the ſkin expoſe the patient to a violent ſtrangury, or other ſpaſms, which in that caſe are moſt to be avoided. The common and beſt internal medicines are nitre and camphire: which laſt will not heat, and neither of the two will diſagree with the ſtomach, if after Hoffman's general manner, we give them in very ſmall, but repeated doſes.

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* MEAD Monita & precepta medica, Cap. i. ſect. iii.

A *phrenitis* is often brought on, or increaſed from a want of a due perſpiration and warmth in the extremities. Wherefore, as ſoon as a ſoldier is brought into the hoſpital, with feveriſh ſymptoms, his hands and feet are to be waſhed with warm vinegar and water *: and through the whole courſe of the diſorder care is to be taken to keep his feet covered. By obſerving this rule, fevers will be brought ſooner to a favourable iſſue, and the patient will be leſs ſubject to a *delirium*.

Abſceſſes have been found ſometimes in the ſubſtance of the brain of thoſe who have died both of inflammatory and nervous fevers, tho' no high phrenitic ſymptoms have appeared in the courſe of the diſeaſe. From whence we may infer, that the inflammation of the *meninges* is attended with more diſorder of the ſenſes and ſpaſms, than an inflamtion and ſuppuration of the brain itſelf. But of this ſubject I ſhall treat more at large under another article †.

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* Compare this with an obſervation in Part II. ch. ii. ſect. 5.

† Jail or hoſpital fever.

## *Of the* OPHTHALMIA.

SOLDIERS are ſubject to an *ophthalmia* or inflammation of the eyes, not only from winter colds, but from their conſtant expoſition to the ſun and duſt during the campaign. The ſlighter caſes may be cured without bleeding; but if any degree of fever is joined, or the inflammation is conſiderable, this evacuation is never to be omitted. The more violent inflammations are not to be cured without large bleedings, unleſs we can make a derivation from the part affected, without draining the whole body. For this purpoſe, bliſters are uſefully applied behind the ears, eſpecially if they are to lie on for two or three days, and if the ſores are afterwards kept running. This part of the cure is ſufficiently known. But what I have obſerved to be ſometimes more efficacious, tho' leſs generally practiſed, is bleeding by leeches; when two are applied to the lower part of the orbit, or near the external angle of the eye, and the wounds allowed to ooze for ſome hours, after they fall off. Wherefore

fore in all greater inflammations, after bleeding at the arm or jugular, I have uſed this method, together with bliſters and purging, if neceſſary. This practice is no leſs recommendable in inflammations of the eyes from external injuries: with this caution, however, that in great fluxions a large quantity of blood is to be firſt let, and immediately after, a revulſion is to be made by a briſk purge. But tho' theſe means are very efficacious in common *ophthalmias*, they are never to be relied on when the diſeaſe is from a ſcrofulous or venereal cauſe.

In all caſes we are to look often and narrowly into the inflamed eye; ſince the inflammation may either begin or be kept up by moats, or by hairs of the *cilia* falling in, or growing inwards, ſo as to cauſe a conſtant irritation.

The ſlighter inflammations from the duſt or ſun, are removed by fomenting with warm milk and water, and anointing the eyes with the *unguentum tutiæ* at night. If the eyes are weak, or but little inflamed, they may be waſhed with brandy and water. But in bad caſes, after the inflammation has yielded a little to evacuations, I found the *coagulum aluminoſum* ſpread on lint and applied at bedtime, the beſt external remedy.

## *Of the* ANGINA.

THE inflammatory quinſey * is moſt frequent and dangerous upon the firſt encampment. Its tendency to bring on a ſuffocation indicates the neceſſity of ſpeedy and large bleedings, purging and bliſtering: but the method of uſing all theſe being ſo well explained by Sydenham, I ſhall only recommend the following remedy as one of the moſt efficacious. Let a piece of flannel be moiſtened with the *linimentum volatile*, or where the ſkin can bear it, with equal parts of oil and of ſpirit of hartſhorn, and applied to the throat, to be renewed once in four or five hours †. By this means the neck, and ſometimes the whole body, is put into a ſweat, which, after bleeding, either carries off or leſſens the inflammation. The *formula* is new, but not the intention; for the ancients applied warm oil with a ſpunge, and bags of warm ſalt*. And ſome later writers have recommended poultices made of the dung of animals †; which ſeems to be only a coarſe and offenſive way of uſing the volatiles.

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* *Fancium ſtrangulatio.*

† This medicine from Dr. G. YOUNG, phyſician at Edinburgh.

I have obſerved little benefit ariſing from gargles, and have even imagined that ſuch as were acid did more harm than good, by contracting the emunctories of the *ſaliva* and *mucus*, and thickening thoſe humours. But a decoction of figs in milk and water ſeems to have a contrary effect, and eſpecially if the ſpirit of *ſal ammoniacum* is added, by which the *ſaliva* is made thinner, and the glands brought to ſecrete more freely: a circumſtance always conducive to the cure.

## *Of the* PLEURISY *and* PERIPNEUMONY.

I COME now to the pleuriſy and peripneumony, the moſt frequent forms of our inflammatory fever. It is firſt to be remembered,

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* Ergo admovere ſpongias oportet; quæ melius in calidum oleum, quam in calidam aquam ſubinde demittuntur. Efficaciſſimumque eſt hic quoque, ſalem calidis cum ſaccellis ſuperimponere. CELS. Lib. IV. cap. iv.

† ETMULLER, Cap. de Angina,

bered, that in thoſe diſorders the pain may be felt in any part of the cheſt, behind and before as well as in the ſides; and ſometimes ſo low down in the back as to be miſtaken for nephritic. Again, that the *pleura*, not only lining the ſides, but alſo inveſting the lungs, *pericardium* and convex ſide of the diaphragm, wherever the inflammation begins, it may be eaſily tranſmitted to any part of this membrane. But in whatever place the obſtruction fixes, ſince the cure is ſo much the ſame, we may be the leſs anxious about knowing exactly where it lies.

The true pleuriſy ought to be diſtinguiſhed from the ſpurious; and alſo from ſome flatulent pains that reſemble it. But as the true and the ſpurious agree in the viſcidity of the blood, and alſo in the eaſe they both receive from bleeding, and from bliſtering upon the part affected, an accurate diſtinction here will be the leſs neceſſary.

But a miſtake about the flatulent kind may be of worſe conſequence. Hypochondriacal and hyſterical people are moſt ſubject to this ſort, tho' ſuch come rarely into our hoſpitals. But to the ſame kind of flatulent ſtitches every perſon is liable, when brought low by ſickneſs, and eſpecially by any diſorder of the bowels. Theſe pains may be owing to wind confined, or excrements pent up in that part of the *colon* next the diaphragm. They generally ſtrike from the breaſt to the back, or from ſide to ſide, affect the breathing, and are ſometimes attended with a ſhort and frequent cough. But the fever, the hard pulſe and ſizineſs of the blood, with other marks of a true pleuriſie, are wanting. Bleeding does harm; but carminative laxatives with warm applications to the part give eaſe. A bliſter is perhaps the only remedy common to both.

Tho' we are to reject the critical days, we muſt ſtill obſerve, with the ancients, certain periods of the diſeaſe, diſtinguiſhable both by the ſymptoms and indications of cure. The ſick are often brought into the hoſpital when the inflammation has ſpread over the lungs, and gone too far to yield to bleeding. Now however improper it would be at that time to commit the whole affair to nature, yet it is certain, that if the *ſputum* appears, as deſcribed by Hippocrates, we are to conſider it as a means of cure, and therefore we are not to divert it by bleeding or other evacuations.

With theſe cautions we are to proceed, letting blood freely for the firſt three or four days of the diſtemper; but, if in that time, the ſpitting begins, the bleeding muſt either be wholly omitted, or ſo moderated, as to relieve the breaſt without impairing the ſtrength and checking the expectoration.

With regard to the quantity and repetitions of bleeding, no preciſe rules can be given; Sydenham has ſpecified forty ounces for the quantity men may, at a *medium*, loſe in a pleuriſy: but this would be much too ſmall, were it not for bliſters, which not only ſhorten the cure, but prevent the loſs of a great deal of blood.

A ſimple pleuriſy, or one attended with little inflammation of the lungs, may be cured with little bleeding. A large bliſter laid to the ſide affected is the remedy. This applied to any other place might ſtimulate and increaſe the diſeaſe; but, by acting directly upon the part, it reſolves the obſtruction, and thereby removes the fever.

This method of bliſtering the ſide is very antient, and was performed by Sinapiſms *. But at preſent the *flies* are only uſed, and the practice is become common in Britain †. Some difficulty remains about the time, whether it is beſt to uſe the epiſpaſtic in the beginning, or not till the pulſe is ſoftened by frequent bleeding. The experience I have had induces me to prefer a ſpeedy application; for in treating great numbers in the hoſpitals abroad, I have ſeen no inconvenience in applying the bliſter immediately after the firſt bleeding; but on the contrary, a more ſudden and certain relief. Nay, frequently when the ſurgeon was not at hand, I have had the plaiſter put directly to the ſide, and the perſon blooded afterwards, being ſatisfied if the vein was opened before the *flies* had time to ſtimulate. Theſe lateral bliſters have been uſually made about the ſize of the palm of the hand with the fingers.

Tho' the ſymptoms ſhould vaniſh upon bliſtering, it will be more ſecure to bleed again; unleſs a profuſe ſweat comes with the relief from pain, and makes all other remedies unneceſſary. But if the lungs are at the ſame time much inflamed, the cure cannot be ſo ſpeedy; for, tho' the firſt bleeding and bliſter ſhould give eaſe, yet repetitions of both will be needful. Sometimes the ſtitch returns and fixes in the other ſide: but this being treated as the firſt, will alſo give way.

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* CELS. Lib IV. cap. vi.

† MEAD. monita et præcepta medica.

A peripneumony is naturally more dangerous than a pleuriſy, and the more ſo, as the epiſpaſtic cannot operate ſo directly upon the lungs as upon the *pleura*. But even in this caſe, bliſtering is moſt to be relied upon, after bleeding. The hardneſs of a ſoldier's bed in field hoſpitals, makes it inconvenient to lay bliſters to the back; but they have equal effects upon the ſides; and when the men have lain ſofter, I have firſt bliſtered the back, and afterwards one or both the ſides. Epiſpaſtics, not only when applied to the cheſt, but alſo to the extremities, tend to relieve the breaſt, and to promote expectoration: whereas bleeding muſt be cautiouſly, if at all, uſed after the *ſputum* appears.

In the firſt ſtage of the pleuriſy or peripneumony, laxative clyſters and the cooler diaphoretics are proper; but all cathartics and warm ſudorifics do harm. The time for attempting a *diaphoreſis*, is when the perſon finds eaſe by the bliſter: but whenever the *ſputum* begins, the diaphoretics muſt either be omitted or joined to expectorants, whereof the chief is *oxymel* of ſquills; or in great heat or drought, ſome more pleaſant acid. But in *lowneſs*, after repeated bleedings, I found the *Sal. C. C.* joined to ſome oil, not only powerful in raiſing the pulſe, but in promoting expectoration when it flagged.

If, notwithſtanding this diſcharge, the breaſt continues to labour, bleeding is ſtill requiſite: but in no caſe can there be more danger of going to extremes, whether in ſuffering the lungs to be overpowered by the omiſſion of bleeding, or hazarding the ſuppreſſion of the *ſputum* by bleeding too freely. Dr. Huxham has delivered ſome of the beſt general rules how to treat ſuch caſes *. But with regard to bliſters, there need be little caution at ſuch a juncture; as they are always ſeaſonable, whether for raiſing the pulſe, relieving the breaſt, or promoting expectoration.

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* Vid. Diſſert. on pleuriſies and peripneumonies, ſubjoined to his eſſay on fevers.

If the obſtruction is not ſoon removed, or an expectoration begun, there will be (as obſerved by the ancients) ſigns of ſuppuration about the ſeventh day; but if the ſpitting has appeared early, it may continue long beyond that term, without any danger of ſuppuration. In the courſe of expectoration, a vomit ſometimes will be uſeful in diſcharging the load of viſcid phlegm. Opiates may be given here, but with caution: for as long as the pulſe is hard, the breathing difficult, or when watchfulneſs is owing to the fever, they do manifeſt harm. But when the fever is over, and ſleep is only prevented by a thin defluxion on the lungs, opiates will both give reſt and promote the ſpitting. If the phlegm is tough, or the patient coſtive, ſquills are then properly joined; but if the body keeps open, and the head is affected by the paregoric, the *Sal. C. C.* is the beſt corrector.

## *Of the* HEPATITIS.

THE liver is a part not only liable to original inflammations, but alſo to ſuffer by tranſlations of matter. I have found by many diſſections that this *viſcus*, next to the lungs, is moſt ſubject to ſuppuration: but I have known one caſe only cured after an abſceſs. In this, the matter pointing outwards was let out, and the patient ſoon recovered. Another occurred, remarkable for the ſituation of the abſceſs, which was altogether on the left ſide of the *linea alba*. The inciſion was nevertheleſs made, and a great quantity of *pus* was evacuated. The patient was relieved, but the operation having been delayed perhaps too long, he died ſoon after. Upon opening the body, the inciſion was found to have paſſed into the liver, but to have been too ſmall for diſcharging ſuch a quantity of matter. A third caſe was ſingular for the flatneſs of the tumour, and an unuſual difficulty in breathing; for, the man could not lie extended, but reſted, for the moſt part, in a prone poſture upon his knees and hands. He had beſides, frequent retchings to vomit, with a conſtant and uncommon pain and ſickneſs at his ſtomach: within two days of his death he grew yellow, and was ſeized with a hiccup. The body being opened, the liver was found wholly ſcirrhous or purulent. The thick and poſterior lobe was ſuppurated; and another large abſceſs roſe from the concave part, which thruſt the ſtomach outwards in ſuch a manner, that had an inciſion been made before death, as in the former caſe, it muſt have paſſed through the ſtomach before it came to the bag.

As to the cure of an inflammation of the liver, I have made no remark that deſerves notice, unleſs, that, after plentiful bleeding, the beſt remedy was a large bliſter laid over the part affected.

## *Of the* INFLAMMATION *of the* STOMACH *and* INTESTINES.

THE ſame method has been ſucceſsfully practiſed in inflammations of the ſtomach and inteſtines; nor have I known local bliſters attended with bad conſequences, how ſoon ſoever they were applied after bleeding. In particular, they are uſeful in the *ileus*; and ſeem to anſwer equally well in fixed pains of the bowels, whether from an inflammatory or a flatulent cauſe.

## *Of the* RHEUMATISM.

THE antients comprehended under one *genus* both the gout and the diſtemper now called the rheumatiſm; giving the name of *arthritis* to the affection of all the joints, whether the pain aroſe from inflammation, or from what the moderns underſtand by a goutiſh humour. If not all, but ſome particular joint ſuffered from either of the two cauſes, the diſtemper was denominated from the part: hence the terms *chiragra*, *podagra*, *iſchias*, &c. all which they conſidered as *ſpecies* of the *arthritis* *. But whereas ſome arthritic pains were found to be of a different nature from others, they diſtinguiſhed them according to the different humours they imagined

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* Vid. HIPPOCR. Lib. de affect. Epit. GALEN. de comp. med. ſec. loc. lib. x. ALEXAND. Trallian. lib. I. cap. I. AETII Tetrab. III. Serm. iv. Cap. xxiii.

gined to be the cauſe of the diſeaſe. Thus, one kind they ſuppoſed to depend on the blood, and, therefore, bleeding was recommended as the chief remedy; and in plethoric habits, even repetitions were inſiſted upon.

Altho' by making this diſtinction, the antients might treat in a proper manner that diſtemper now called a rheumatiſm; yet as names are ſo apt to impoſe upon the underſtanding, it is to be imagined, that the different kinds were often confounded, and conſequently often improperly managed. Accordingly we find in later times, that the phyſicians came to conſider all pains of the joints, that were not plainly goutiſh, as the effects of a catarrh. Now this change of theory had a worſe conſequence; for, all catarrhous humours being ſuppoſed of a cold nature, bleeding was forbid, and the cure of an acute rheumatiſm was then attempted without opening a vein. Botallus was the firſt who oppoſed this practice, and diſtinguiſhing the inflammatory *ſpecies* of a catarrh from the reſt, declares repeated bleeding to be neceſſary for curing it, and mentions two caſes wherein his method ſucceeded *.

After him, Ballonius firſt uſed the term *rheumatiſm*, to denominate this *ſpecies* he alſo conceived to be different from either a gout or common fluxion †. The ſame author has alſo deſcribed the diſeaſe in a maſterly way, and recommended repeated bleeding as the indiſpenſible part of the cure. This method has been followed cloſely by the beſt authors, and in particular by Riverius and Sydenham.

How often rheumatiſms occurred, eſpecially in the beginning of the campaigns, was ſeen in the general account §; but we muſt add, that tho' the diſtemper appeared ſometimes with all the violence mentioned by Ballonius and Sydenham, it was generally of a much milder kind. In a complete and obſtinate rheumatiſm the joints are conſiderably ſwelled and inflamed: but in our fevers with rheumatic pains, that was rarely the caſe; and therefore the cure was completed in a few days, by twice or thrice bleeding and promoting a *diaphoreſis* by the cooler medicines, particularly by vinegar-whey. But if the rheumatiſm was attended with an inflammatory ſwelling of the joints, ſweating was improper, and the cure was only to be obtained by repeated and almoſt daily bleedings, till the patient was without fever and the pains were either entirely removed or became eaſier. And in this courſe we may proceed the more boldly, as thoſe that are ſubject to the diſtemper are generally in the vigour of life, and are either plethoric, or at leaſt able to bear great evacuations. Add, that frequent bleedings weaken the body perhaps leſs in this diſeaſe than in any other.

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* Lib. de curat. per ſang. miſſ. cap. xii.

† Lib. de rheumatiſmo.

§ Vid. Part I. ch. iii. p. 21. Ch. iv. p. 36.

If the pain and ſwelling of the joints remain after the fever is abated by repeated bleedings, apply three or four leeches to the part where the inflammation and tumour are the greateſt; and let the blood ooze till it ſtops of itſelf. As the relief hereby obtained is ſometimes conſiderable, and the evacuation but ſmall, the repetitions need not be limited. Ballonius alſo mentions this practice; and I have had ſufficient experience of it to recommend it to others. But we are to expect no benefit from leeches in any pains of the joints, not attended with both inflammation and ſwelling.

In the true acute rheumatiſm internal medicines avail little. The beſt are the neutral ſalts with very ſmall doſes of camphire, ſo as neither to heat or force a ſweat. And as to diet, it muſt be of the loweſt kind, as Sydenham well adviſes.

Ballonius mentions paregorics, but without defining the kind, or the times moſt proper for giving them. Sydenham condemns them entirely, and, ſo far as I have obſerved, juſtly. Outward applications are alſo to be omitted, as long as any fever or inflammation remains. The ſpirituous and volatile liniments inflame, and the emollient fomentations, tho' they give eaſe for the time, unleſs very ſparingly uſed, do harm by relaxing.

If the rheumatiſm is confined to one part of the body, attended with little or no fever, and recent, it may be cured by bleeding once, and ſweating with the following draughts.

℞ *Gumm. Guajac. (in vitell. ovi q. ſ. ſolut.)* ʒß. *Aq. fontan.* ℥ij. *Aq. alexeter. ſp.* ℥ß. *Sp. Minderer. (Ph. Edinb.)* ℥i. *Syr. e Cort. Aurant.* ʒij. *M. & divid. in hauſt.* ij. *ſum. unum h. ſ. alterum ſummo mane.*

If the patient does not ſweat eaſily, the gum may be given by itſelf, as a laxative, and continued daily till the pain goes off.

But the chronic rheumatiſm is one of the moſt obſtinate diſeaſes of the hoſpital; being either the remains of a rheumatic fever, or the continuation of pains that proceeded at firſt from leſſer but neglected colds. In complaints of this kind, if the blood is not found ſizy, we may preſume the ſoldier either pretends indiſpoſition, or that the pains are of another nature. Sydenham has alſo deſcribed this *ſpecies*, wherein, tho' there is no fever, he recommends bleeding; and which, of all remedies, I obſerved to be the moſt efficacious. The patient is therefore to loſe about eight ounces of blood, once in eight or ten days, as long as it is ſizy, or his complaints remain: and between whiles, let him be purged in this manner.

℞ *Gum.*

℞ *Gumm. Guajac. (in vitell. ovi q. ſ. solut.)* ℈ij. *Aq. fontan.* ℥ij. *Aq. e Nuc. Moſch.* ʒij. *Syr. e Cort. aurant.* ʒi. *M. f. hauſt. mane ſummend. cum regim.*

On the intermediate days, let him take, twice or thrice in the four and twenty hours, fifty or ſixty drops of the *Spiritus C. C.* in a draught of water. When I began this method, the ſpirit happened to be made with quick-lime; but it was not for that the leſs ſucceſsful. If the joints are ſwelled and inflamed, leeches are to be uſed, as before; but if there is no inflammation, the aking parts are to be rubbed with flannel, and anointed with the *linimentum volatile*, or *linimentum ſaponaceum*, according as the ſkin is too much hardened or relaxed by the continued uſe of the one or the other. After a perſon has continued ſome time in this courſe, his recovery will be quickened by the uſe of the cold bath: and to thoſe who can afford it, riding is ſpecific.

By this method I have known many cured; but I muſt likewiſe acknowledge, that ſeveral ſlight caſes, in appearance, have withſtood theſe and all other methods I could think of. Sometimes venereal pains may be miſtaken for rheumatic; at other times, the two may be joined. A ſalivation does not cure a chronic rheumatiſm; but there are caſes which will ſooner yield, if once or twice a week we give a large doſe of *Calomel* over night, and purge it off next morning.

Some of the more obſtinate pains may be of that kind, which Sydenham calls the ſcorbutic rheumatiſm, or others, more properly, the *Arthritis vaga*, or flying gout. For, tho' the common men, and eſpecially at their time of life, ſeldom or never feel the true gout; yet, by irregularities or diſeaſes, the humours may tend that way, without producing any regular fit. And I ſuſpect, that thoſe pains may be of this kind that ſometimes are felt after obſtinate and irregular intermittents; which Sydenham believes to be owing to the Bark, tho' they were taken notice of long before the uſe of that medicine *.

As the blood may be ſizy in the vague arthritic pains, as well as in the rheumatic, it will ſometimes be hard to diſtinguiſh them;

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* Vid. BALLON. de Rheumatiſmo.

and therefore, as a new and more certain diagnoſtic, I ſhall inſert another curious obſervation, communicated to me by the learned Dr. Clerk.

*The* Arthritis vaga, *or flying gout (erroneouſly called a ſcorbutic rheumatiſm) is often diſtinguiſhed by the urine of the perſon, in which floats certain filaments, not ſo tranſparent as the urine itſelf, but when taken out of it, appears as pellucid as cryſtal, ropes to a great length, and when dried turns to a white* Calx. *This I take to be the* materia morbifica *of the gout, gravel, goutiſh, ſciatic and all true arthritic pains, diſtinct from the rheumatiſm. I ſuppoſe it to be that humour the antients call* pituita vitrea, *not perceivable in blood when let, but conſpicuous in the urine of ſuch as labour under theſe diſeaſes. The moderns (at leaſt none that I have looked into, except thoſe who copy the antients) make no mention of this* pituita. *Soap is the beſt diſſolvent of it that I have tried, and I have given it from half an ounce to one ounce a day, for ſome months (when requiſite) in the ſciatic and other arthritic pains.*"

The ſciatic of our hoſpitals is almoſt always of the rheumatic kind, and therefore, if recent, yields to bleeding and bliſtering upon the part. But if the diſtemper is of a long ſtanding, or the cauſe goutiſh, the matter will lie too deep for a bliſter, or any of the common medicines. I remember two caſes in the hoſpital, in which the pain was exquiſite and conſtant, and nothing gave relief; ſo that the men, after pining long, died at laſt of the agony. At that time I had not thought of any diſſolvent.

## CHAP. III.

## *Obſervations on* COUGHS, *and the* PHTHISIS PULMONALIS.

COUGHS and conſumptions are properly annexed to inflammatory diſeaſes. For, a recent cough, from cold, may be conſidered as the loweſt degree of a peripneumony; and a neglected cough, as the beginning of a conſumption.

Obſtructions are ſucceeded by tubercles, which making the cough worſe, at laſt tear and ulcerate the lungs. In ſeveral bodies which I diſſected, I found the lungs full of both tubercles and ulcers.

We cannot, therefore, be too careful in removing colds in the beginning. But this part belongs to the regimental ſurgeon, who is firſt applied to, and who may be aſſured a cough is bad indeed, when a ſoldier complains of it. The diſeaſe being of an inflammatory nature, bleeding is the chief remedy; which alone will frequently cure bad colds, whilſt all other medicines may be ineffectual without it. Recent coughs, after bleeding, are ſoftened by a mucilage of linſeed, or by any common ſweet oil. But the oils are made more efficacious by the addition of a volatile alcaline ſalt, in this manner:

℞ *Ol. Olivar.* ℥iß. *Aq. font.* ℥vj. *Sp. C. C.* *gtt.* LX. *Syr. pectoral.* ℥i. *Cap. quarta quaque hora Cochl.* iij. *vel* iv.

When the obſtruction is of an older date, oily medicines are not only uſeleſs, but relax the ſtomach, pall the appetite, and increaſe the diſorder. A continuance of them requires emetics more than the diſeaſe itſelf.

In the older and more ſtubborn coughs, or in the firſt ſtage of a conſumption, when the patient complains of pains in his ſide, boundneſs at the breaſt, or hot and reſtleſs nights, I have truſted moſt to ſmall but repeated bleedings †, and to pills made up of ſoap, ſquills and gum ammoniac *.

I have found theſe ſmall bleedings not only beneficial in old coughs, threatening conſumptions, but alſo after a purulent ſpitting and hectic ſymptoms appeared. The quantity of blood drawn was from four to ſeven or eight ounces, once in eight or ten days, and ſometimes a vein was opened after ſhorter intervals. It is obſervable, that the patients never find themſelves ſo much relieved on the firſt as on the ſecond or third night after veniſection. The blood was conſtantly ſizy; but if ever it had been ſeen in a reſolved ſtate, to have inſiſted then upon taking away more, had been altogether improper. Nor, would I recommend this method for com-

† Conf. MEAD. mon. et præc. med. ch. I. ſect. x.

* Vid. Pil. Scillit. PHARM. EDINB.

mon practice, without making great allowance for the ſtrength of our men, and ſuiting the quantity of blood to be let to the condition of weaker patients.

But, I can freely recommend, from repeated trials, the uſe of ſetons or iſſues, made in the ſide upon the part that is moſt affected. In particular, they were uſeful to ſuch men, as being frightened at the loſs of ſo much blood, had it not ſo often taken away as was judged neceſſary.

In thirſt, heat and other ſymptoms, the ſigns of a putrid ſtate of the humours, the ptiſan is to be acidulated with the ſpirit of vitriol; and the aliments are to be choſen of the aceſcent kind. A mixture of equal parts of barley water and ſweet milk, ſeaſoned with ſugar and nutmeg, makes a proper and an agreeable part of diet. Butter-milk is here moſt ſpecific. In coſtiveneſs, let the patient drink a decoction of bran with raiſins and liquorice.

I have found nothing diminiſh the hectic fits ſo much as ſmall bleedings; but it will be proper to add the ſaline draughts and a cooling diet. Colliquative ſweats were moſt ſafely checked by lime-water, whereof the patient drank about a pint a day ſoftened with a little new milk.

In the advanced ſtate of a conſumption; we may diſtinguiſh two ſorts of coughs, one cauſed by the ulcers, and the other by a thin rheum falling upon the *fauces* and *trachea*; which parts being then deprived of their *mucus*, become extremely ſenſible to irritatation. And it is this laſt kind which, perhaps, is the moſt painful and teazing to the patient. The ſame medicines are not proper for both. The firſt ſort is to be treated with the balſamics, if the ulcer is open and the matter can be expectorated. For this purpoſe I have uſed the balſam of Peru, but without finding it more efficacious than the *Capyvi*. Of this laſt I have commonly given about ten drops, twice a day, in a bolus of conſerve of roſes; or, if that form was leſs agreeable, in the following mixture.

> ℞ *Balſam. Copaiv.* ʒi. *ſolv. in vitell. ovi. q. ſ. et add. Aq. fontan.* ℥iv. *Aq. Cinnamom. ſp.* ℥i. *Syr. e Cort. Aurant.* ℥ß. *M. Cap. bis die Cochl.* ij. *add. pro. r. n. Elix. Paregoric.* ʒij.

The laſt ingredient is added occaſionally to keep the balſam from purging.

The other kind of cough can only be palliated by incraſſants; and for that purpoſe I have conſtantly uſed the conſerve of roſes, and opium. The firſt is altogether ſafe, and otherwiſe well adapted to the nature of the diſeaſe, but of weak virtues: the latter is the moſt efficacious, but is to be given with caution, conſidering how apt it is to heat, to bind the body, and to obſtruct expectoration. However, as theſe bad qualities are in a great meaſure to be corrected by ſquills *, as ſoon as the patient begins to complain of reſtleſs nights from coughing, I have uſually preſcribed a draught, with a drachm and a half of *Oxymel Scilliticum*, and fifteen drops of *Tinctura Thebaica*, to be given at bed time, and have increaſed the doſe of each ingredient when there ſeemed to be occaſion for it.

I have never ventured to give the Bark in any ſtage of the conſumption, unleſs in the convaleſcent ſtate, when the lungs ſeemed to be free from obſtruction. Then, I have ſometimes given the *Tinctura Corticis* with the *Elixir Vitrioli*, in order to brace the fibres and to reſtore the appetite.

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* Communicated by Dr. Clerk.

Riding and aſſes milk, the two great reſources, are wanting in military hoſpitals: what is ſtill worſe, the air of ſuch places, or of full barracks, is very contrary to the cure. Hence it happens, that tho' theſe means may often ſucceed with men better accommodated, they will be generally fruſtrated by the foul ſteams they breathe here: and tho' a ſoldier may chance to eſcape their bad effect and recover, it is odds but he relapſes, by being expoſed to colds, as ſoon as he returns to his duty.

In this manner I have treated the *Phthiſis Pulmonalis*. I have likewiſe obſerved great benefit ariſe from ſmall and frequently repeated bleedings in the cure of wounds, when matter has been abſorbed, and a hectic fever produced thereby. This generally happens from ſparing inciſions, or not being able to make them, in the cure of gun-ſhot wounds.

CHAP.

## CHAP. IV.

## *Obſervations on the* BILIOUS, *or* REMITTING *and* INTERMITTING FEVERS *of the* ARMY.

I COME now to conſider the diſeaſes of the bilious kind*, which being the moſt common and fatal to an army, and leaſt known in theſe parts, ſhall therefore be treated of in a more full and regular manner than the preceding.

The bilious diſeaſes begin about the decline of ſummer, and become epidemic in autumn, appearing earlier, more general, and with worſe ſymptoms, in proportion to the heat of the ſeaſon, and moiſture of the ground and climate. Tho' of different forms, they are all of a like nature, and may be properly reduced to two heads, *viz.* fevers and fluxes.

Beginning with the bilious fevers, I ſhall firſt deſcribe that which is frequent in every camp; ſecondly, what ſeemed more peculiar to the marſhes; in the third place, I ſhall enquire into the nature and cauſes of both; I ſhall then proceed to compare theſe fevers with thoſe of other places in the like circumſtances: and laſtly, I ſhall propoſe the method of cure, both for the fevers of the camp, and for ſuch as occur in the marſhy countries.

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* Why ſo called, vid. Part II. ch. i. p. 91.

## SECT. I.

## *Of the Symptoms of the Bilious Fever of the Camp.*

IN the month of June, the fevers in the camp are fewer and leſs inflammatory than upon firſt taking the field, and as the ſeaſon advances they are attended with ſtill leſs inflammation, but with more diſorder of the ſtomach and bowels, with pains in the head, and they have all a tendency to remit. This change, juſt diſcernible after the ſolſtice, becomes remarkable before the end of ſummer, or in the beginning of autumn.

The epidemic differs according to the nature of the ground, and therefore I ſhall diſtinguiſh it into two *ſpecies*, one, incident to an army on dry ground; and the other, infeſting it in damp and marſhy countries. I ſhall begin with the former.

The bilious or remitting fever of the camp begins with chillineſs, laſſitude, pains of the head and bones, and a diſorder at the ſtomach. At night the fever runs high, the heat and thirſt are great, the tongue is parched, the head akes violently, the perſon gets no reſt, and often becomes delirious: but generally in the morning an imperfect ſweat brings on a remiſſion of all the ſymptoms. In the evening the paroxyſm returns, but without any cold fit, and is commonly worſe than the former: on the ſecond morning, it remits as before. Theſe periods go on daily, till the fever changes inſenſibly, either into a continued or into an intermitting ſhape. Sometimes looſe ſtools carry off the fit and ſupply the place of ſweats.

Altho' the fever moſt frequently appears in the form of a quotidian, yet it is ſometimes to be ſeen in a tertian ſhape. But tho' the diſtemper reſembles an ague in many particulars, yet it is a rare thing in the camp to meet with a real one, unleſs the perſon has been ill of it before he took the field.

The remiſſions uſually appear from the beginning, and eſpecially if the patient has been plentifully blooded. Sometimes there are no remiſſions for the firſt two or three days. Hæmorrhages of the noſe happen frequently in the height of the paroxyſm, and always bring on the remiſſion ſooner and make it fuller. Vomiting or purging have like effects. But I remember of no natural evacuation making a complete cure, unleſs when a *cholera morbus* ſupervened.

The fits are rarely preceded by ſhiverings, or any ſenſe of cold after the firſt attack; the pulſe is always full and quick during the paroxyſms, and in the remiſſions it ſtill indicates ſome degree of fever. The blood is florid, the *craſſamentum* is firm, in a large quantity, and ſinks in the *ſerum*. The blood, therefore, ſhews ſome ſigns of inflammation, even in the beginning of the epidemic; but towards the end of the campaign it acquires an inflammatory cruſt: for by that time, to the other ſymptoms are joined either ſtitches, rheumatic pains, or a cough from colds.

Whilſt the weather continues warm, the bilious ſymptoms are moſt frequent; but as winter approaches, the inflammatory prevail.

The urine is high coloured and crude, till the fever is brought to intermit. What is voided by vomit or ſtool is generally of a bilious or corrupted nature. Coſtiveneſs not only often precedes, but accompanies the diſeaſe; and when that happens, the belly feels hard, and the patient complains of wind. Tho' all do not vomit, yet every one feels a diſorder at the ſtomach, and eſpecially during the hot weather.

Worms are frequently voided by ſtool, ſometimes by vomiting. They are of the round kind; and ſuch as are troubled with them have more obſtinate gripings or ſickneſs at the ſtomach. In thoſe caſes, ſtitches are frequent, but being of a flatulent kind, are not relieved by bleeding.

Some grow yellow, as in the jaundice. This colour was found more frequent during the firſt campaign than afterwards: it was an unfavourable, but not a mortal ſign. The body of one dying with this ſymptom was opened, but no *calculus* nor any kind of obſtruction was diſcovered in the gall-bladder, or bilary ducts.

The infantry was more ſubject to the fever than the cavalry, and theſe laſt more than the officers: which was owing to the difference of cloaths and accommodation *.

There were no critical days, nor any certain duration of the fever, which was longer or ſhorter, according to the method of cure. Its moſt favourable and common determination, was in an intermittent, if proper means were uſed: but it was always dangerous when it changed into a continued form. Tho' this fever is of itſelf not dangerous, yet it is often fatal to an army, from the numbers that are ſeized with it at a time; and by its changing into a continued and malignant ſhape, either by neglecting it at firſt, or by crouding together too many of thoſe that are ill of it into an hoſpital.

This bilious or remitting diſtemper attended every campaign, but was moſt frequent and violent after the hot ſummers of the years 1743 and 1747. But in the campaigns

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[*] Vid. Part. I. ch. iii. p. 29.

1744 and 1745, the ſeaſons being temperate, the fevers were both few and mild.

## SECT. II.

### *Of the Symptoms of the Bilious Fever in low and marſhy countries.*

THIS *ſpecies* of the bilious fever was mentioned in the general account of the diſeaſes moſt incident to the Netherlands [*]; and alſo in the account of thoſe which occurred during the two laſt campaigns [†]: but the full deſcription was reſerved for this place.

We are firſt to obſerve, that tho' all moiſt countries are ſubject to intermittents, yet if the moiſture is pure, and the ſummers are not cloſe and hot, theſe fevers will moſtly appear in a regular tertian ſhape, and be eaſily cured. But if the moiſture ariſes from long ſtagnating water, in which plants, fiſhes and inſects have died and rotted, then the damps being of a putrid nature, not only occaſion more frequent, but more dangerous fevers, which appear oftner in the form of quotidians, or double tertians than that of ſingle ones. Theſe are not only apt to begin in a continued ſhape, but after intermitting for ſome days, to change again into *continuals* of a putrid and malignant nature. It is remarkable how much theſe fevers vary with the ſeaſon; for, however frequent, violent or dangerous they have been in the decline of ſummer or beginning of autumn, when the putrefaction is at the height, yet before winter they are reduced to a ſmall number, turn mild, and generally aſſume a regular tertian form.

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[*] Part I. ch. i. p. 8.

[†] Part I. ch. vii. p. 70. Ch. viii. p. 79.

The worſt kind of fevers were obſerved to prevail in the country bordering upon the inundations in Dutch Brabant *; the next were thoſe of Zealand †; of the third degree, were ſuch as appeared in the lines of Bergen-op-Zoom ||; and the mildeſt ſort, comparatively, were thoſe that were moſt frequent in the cantonements round Eyndhoven §, in villages rendered moiſt by plantations and under ground water, but that not putrid. I ſhall deſcribe the firſt and worſt kind, from which it will be eaſy to judge of the nature of the reſt.

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* P. 79. † P. 70. || P. 72. § P. 77.

In the end of July 1748, when the troops had been about a fortnight or three weeks in the cantonements, whilſt the days were ſultry, but the nights cool and foggy*, ſeveral of the men (of thoſe regiments that lay near the inundations) were ſeized at once with a burning heat and violent head-ach: ſome feeling a ſhort and ſlight chillineſs before, others mentioning no preceding diſorder. They complained, beſides, of intenſe thirſt, aking of the bones, a pain of the back, great laſſitude and inquietude, frequently a *nauſea*, ſickneſs, or of a pain about the pit of the ſtomach, ſometimes attended with a vomiting of green or yellow bile, of an offenſive ſmell. The pulſe was upon the firſt attack generally depreſſed, but roſe upon bleeding. There were ſeveral inſtances of the head being ſo ſuddenly and violently affected, that without any previous complaint, the men run about in a wild manner, and were believed to be mad, till the ſolution of the fit by a ſweat, and its periodic returns diſcovered the true nature of their *delirium*.

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* Part I. ch. viii. p. 76, and ſeq.

At this time Dr. Stedman, then ſurgeon to the *Greys*, acquainted me, "that, two of their "men, who were the firſt taken ill, were at "once ſeized with violent ſymptoms of an "ardent fever, and tho' they were ſpeedily "and plentifully blooded, yet, in an hour "thereafter, both were in a high *delirium*, "which continued for ſome hours and went "off with a profuſe ſweat, under which all "the other ſymptoms either abated or vaniſhed. That, next day, about the ſame "hour, the paroxyſm recurred, and in ſix "or ſeven hours run the ſame courſe. In "this ſhape the fever appeared with many "of that regiment, but others had not the "paroxyſms ſo diſtinct, as the hot fits were "long and followed by imperfect ſweats, "affording little relief. Sometimes the fever had daily intermiſſions, but generally "it only remitted; and the remiſſions were "often ſo imperceptible, that the diſeaſe appeared almoſt in a continued form. That, "the nearer it approached to this laſt ſtate, it "was the more intractable; but when the "paroxyſms were diſtinct, with an intermiſſion of ſome hours between them, the pa-

" tients, for the moſt part, did well, however " great the *delirium* was during the hot fits. " That a few returns of thoſe paroxyſms re- " duced their ſtrongeſt men to ſo low a con- " dition as not to be able to riſe. That, ſome " became at once delirious without any pre- " vious complaint, and would have thrown " themſelves out of windows, or into the wa- " ter, if not prevented: that the phrenzy con- " tinued for ſome hours, after which the pa- " tients falling into a profound ſleep awaked " quite ſenſible, but with an intollerable " head-ach. That others, with whom the " fever appeared in a continued or remitting " form, had critical ſweats about the ninth " day; after which it became a regular in- " termittent. A few had a *criſis* by ſtool or " urine, and there were ſome who were ill " about three weeks, without any ſenſible " remiſſion; after which the fever ended " with ſome quotidian paroxyſms: theſe " men, during their illneſs, had gentle ſweats, " or rather a continual moiſture over their " body. That many, upon being firſt taken " ill, had bilious vomitings; and ſeveral " voided round worms both ways. That

“ the profuſe ſweats had always a putrid “ ſmell; and the diſcharge from the bliſters “ was ſo offenſive, that the nurſes declined “ dreſſing them. What was moſt remarkable, a few of thoſe who died were obſerved to have a regular pulſe, tho' very “ near their end. That all thoſe who died, “ had for ſome days before, a cadaverous ſmell, “ and immediately after death, livid ſpots “ and other ſigns of a mortification.” Dr. Stedman concluded with obſerving, “that the “ ſame diſtemper was alſo common among “ the peaſants of the cantonements near their “ quarters, and that a great number of them “ died.”

This account of the beginning of the epidemic being ſo full and accurate, I need only add, that it agreed with the obſervations of all the ſurgeons of the other regiments in the like ſituation; allowing for ſome variation, according to the different circumſtances of thoſe corps. Thus Mr. Lauder, ſurgeon to the Iniſkilling regiment, then Lord Rothes's, informed me, “ that moſt of their men were “ taken ill upon their return from forraging. “ For, the regiment being cantoned upon the

" right and left of St. Michel's Geſtel (their " principal quarters) cloſe upon the inunda- " tions, and many of the quarters being above " two leagues from Bois le-duc, where the " magazines were, the men were obliged to " ſet out about four in tbe morning, in order " to get back before the heat of the day. " That, at that early hour, the meadows and " marſhes on each ſide of the road were con- " ſtantly covered with a thick fog of an of- " fenſive ſmell, which he looked upon as the " chief cauſe of the ſickneſs. For, tho' " the party returned generally before noon, " Mr. Lauder always found ſeveral among " them already in a fever, and ſome of them " actually delirious. Nay, that a few on their " way home were ſo ſuddenly taken with a " phrenzy, as to throw themſelves from off " their truſſes into the water, imagining they " were to ſwim to their quarters. That, " from the firſt attack, as many of them as " were ſenſible complained of a violent head- " ach, thirſt and burning heat; and that all " of them, attempting to ſit up, were ready " to faint away, with a giddineſs, ſickneſs at " ſtomach, and retchings to vomit. Theſe

" fevers

" fevers were for ſome days of a continued
" form, or at moſt attended with ſlight re-
" miſſions; after which, they either remitted
" more plainly, or thoroughly intermitted.
" That at firſt the pulſe was ſmall and de-
" preſſed (tho' the patient was then delirious)
" but that it always roſe upon bleeding." The ſame gentleman has lately told me *, that two of thoſe men who were taken ſo ſuddenly with a phrenzy (in their return from forraging) tho' they recovered of their fever, have been ever ſince epileptic; and that all the reſt who had been ill, and are yet in the regiment, are ſtill liable to returns of an ague.

The condition of the Foot was ſomewhat different; for, few of them being cantoned near the inundations, their fevers, tho' frequent, were generally of a milder nature: yet ſome of thoſe corps had the ſickneſs alſo in a high degree, from the moiſt and corrupted air of their quarters. The village of Dinther † lay very low, was ſurrounded with ditches, and cloſe planted with trees. Mr. Tough, ſurgeon to the battalion there, ob-

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* Viz. about three years after this ſickneſs.

† Vid. Part I. ch. viii p. 81.

ſerved, "that the meadows were covered "every evening with a fog, which continued till the next morning after ſun-riſing, "and had always the offenſive ſmell of a "foul ditch newly drained. That the men "were commonly taken ill in the night-"time *, with a ſhuddering or ſenſe of cold, "which was ſoon followed by a violent "head-ach, intenſe heat and other feveriſh "ſymptoms. At which time the pulſe was "ſo ſmall and depreſſed, that if a vein was "opened, the blood at firſt would ſcarce run; "but that after ſome evacuation, it flowed "briſkly, and the pulſe roſe upon bleeding. "A profuſe ſweat ſucceeded the heat, and "with that a remiſſion or intermiſſion of the "fever. That, the paroxyſms returned every "evening, and if care was not taken to ſtop "the fever ſoon, it was apt to change into "a continued form, with malignant ſymp-"toms. In three caſes he obſerved petechial ſpots; and in a fourth, a mortifica-

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[*] It is to be remarked, that the dragoons having better pay, generally hired beds of their landlords, or at leaſt lay warm in their cloaks; but the foot ſoldiers wanting theſe advantages, lay in barns and other damp places, without any covering.

“ tion under the left breaſt, which yet was
“ cured by the Bark. There was, beſides,
“ one inſtance of a man, who being ſuddenly
“ ſeized with the uſual head-ach, and not
“ immediately blooded, got out of his quar-
“ ters and ran about in the fields like one
“ diſtracted.”

In the greateſt heat of the weather and rage of the diſtemper, moſt of the fevers anſwered the deſcription of the Κᾶυσος; or *ardent* fever of the antients, which Hippocrates never ranks with the inflammatory diſeaſes of the winter and ſpring, but always with the bilious epidemics of ſummer and autumn *: tho' later writers have applied this term to all fevers attended with great inflammation.

But it was obſervable, that even in the very worſt tracts of thoſe countries, as ſoon

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[*] Aphor. Lib. III.

The ardent fever of the antients was either continued or remitting; of which laſt Gorræus gives the following deſcription. *Eſt* ὁ καῦσος *tertianæ febri* ὁμογενὴς, *ut qui ab iiſdem cauſis, eodem anni tempore & iiſdem corporibus provenit, a quibus & tertianæ febres excitari ſolent. In tertiana intermittente primum rigor, deinde* ἀπυρεξία *eſt: verum ardentis exacerbationes nullo cum rigore fiunt, nec unquam integre ſolvuntur, ſed modice tantum remittuntur.*” Vid. Definit. in voce Κᾶυσος.

as the weather cooled in the decline of autumn, all the fevers began to aſſume a milder nature, and that, in the end of the ſeaſon, they differed little from the common intermittents of other places.

There were a few quartans, but theſe did not appear till late; nor were they hard to cure, unleſs when they ſucceeded to ſome other forms of this fever, which had already made obſtructions in the *viſcera.*

When the ſickneſs was at the worſt, many voided round worms; which were never the cauſe of the fevers, but, as was obſerved before, often concurred with other circumſtances to render them more difficult of cure.

At the height of the epidemic it appeared, that both intermittents and remittents, by extending or doubling the paroxyſms, frequently changed into a continued, putrid, and dangerous form; and that moſt of thoſe we loſt, died this way. Theſe men, as was remarked, had a putrid ſmell for a day or two before their death, and ſoon after it their bodies mortified. Some had petechial ſpots, tho' the place where they lay was neither crouded with ſick, nor too cloſe: and to theſe other ſymptoms were added, the ſame with thoſe of the hoſpital or jail diſtemper.

But in general, the mortality was not in proportion to the number of the ſick, or the alarming nature of the ſymptoms. Thoſe who were kept with their regiments did better than ſuch as were ſent to the general hoſpital, where the air was foul, and apt to convert the ſlighter caſes of theſe fevers into a malignant form. Tho' the diſtemper was violent, it yielded to medicine, and no kind of illneſs ſeemed to require it more: for, a great number of the country people periſhed for want of it, whilſt moſt of our men recovered by the timely care of the ſurgeons of their regiments. Of the *Greys*, who were the moſt ſickly, twenty men died in all; and four of thoſe were out of a ſmall number that had been ſent to the general hoſpital. The Iniſkilling regiment, whoſe *returns* were the next higheſt, loſt eleven only. Both which numbers will appear inconſiderable, if we reflect what a multitude of patients and bad caſes were under the management of ſo few hands *.

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* Vid. Part I. ch. vii. p. 70. Ch. viii. p. 80, 81.

One of the moſt unfavourable circumſtances attending this fever, was the proneneſs to a relapſe. The danger of it was greateſt during the hot weather, leſs in the decline of autumn, and leaſt of all after the froſts began. But, in the following ſpring, relapſes became ſo frequent, that thoſe regiments, which had ſerved in Zealand in the preceding autumn, had, next campaign, above four times more ſick than any other corps in the line.

Frequent relapſes brought on viſceral obſtructions, which made the intermittents more obſtinate and irregular, and at laſt to end in a dropſy or jaundice. In this bad ſtate of the *viſcera*, there was uſually felt a hard tumour on the left ſide of the belly, lower than the falſe ribs, which the common men called the *ague-cake*. But, as none of thoſe who died with this ſwelling were opened, the part affected could not be aſcertained. It was often accompanied with ſwelled legs, a diſtention of the whole belly, or with ſome other hydropical ſymptom; and whilſt it remained, the fits could not be ſafely ſtopt by the Bark.

It was a bad ſign, but not a mortal one, ſince many who had it, recovered.

I have likewiſe met with ſome caſes of the tympany, a diſtemper which ſeemed chiefly owing to a premature uſe of the Bark. But as to other obſtructions, and in particular thoſe which brought on the *aſcites*, I obſerved that they happened as often without, as with the Bark; and therefore ſeemed generally to depend on the long continuance and obſtinacy of the intermittent.

It was remarkable, that whilſt the ſickneſs raged with ſuch violence amongſt the common men, it appeared generally in a much milder degree among the officers, who ſeldom had the fever in a continued form, or attendded with any malignant ſymptoms, but in the ſhape of ſingle and double tertians, or of quotidian remittents, that ſoon came to regular intermiſſions. The reaſon was, their having drier quarters, leſs expoſition to the ſun and fogs, the advantage of a better diet, and the uſe of wine.

SECT.

## SECT. III.

### *Of the Nature and Cauſe of the bilious, or remitting and intermitting fevers of the camp, and of low and marſhy countries.*

THE autumnal fever of the camp and that of low and marſhy countries being ſo much alike, it ſeems reaſonable to refer them to ſimilar cauſes.

One general and remote cauſe of both, is owing to a hot and cloſe ſummer, attended with a moiſture of the air, but without rain. Another, and a nearer cauſe, may be referred to great exhalations, but more particularly, if they are of a putrid kind. But the ſuppreſſion of perſpiration, or the admiſſion of corrupted ſteams into the blood, at a time when it is moſt putreſcent, ſeem to be the more immediate cauſes of this diſtemper. And the actual corruption of the humours may be conſidered as the *cauſa proxima*, or the very nature of it.

To demonſtrate this theory in a regular manner, it would be neceſſary to ſhew, that the perſpirable matter is either actually ſeptic, or at leaſt the occaſion of putrefaction, when retained too long in the blood; and that all retentions of that kind are attended with a proportional degree of fever. But as theſe points would require too long a diſcuſſion for this place, I ſhall refer them to the authors who have profeſſedly treated of them *.

I ſhall only obſerve, that we are not to confound the ordinary checks given to perſpiration in Britain (where the weather is ſeldom cloſe, moiſt and hot for any conſiderable time) with what happens in other climates, ſubject to ſuch intemperature, and where the inhabitants having in ſummer and autumn humours of a more putreſcent nature, require a more conſtant evacuation of what is corrupted †. How far a fever is occaſioned by a putrid ferment, may be learned from

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* SANCTOR. Med. Stat. paſſim.
Si parcior eſt (perſpiratio) oritur putredo, febris, &c. BOERHAAVE Inſtitut. Med. § 778.

† What is ſaid by Sanctorius of the winters in Italy, is more or leſs applicable to all the ſeaſons in this iſland: *Adiapneuſtia, quæ æſtate malignam febrem, hyeme vix minime alterationem efficere poteſt: corpora enim acriori perſpirabili æſtate referta ſunt, quam hyeme.* Med. Stat. ſect. II aphor. xxxv.

the ſhuddering, heat and ſweat conſequent upon the abſorption of any purulent matter.

Now, whether a foggy and moiſt air occaſions a ſtoppage of perſpiration by entering into the blood, or by its external application to the pores of the ſkin and to the lungs, is not here material; it being ſufficient for our preſent purpoſe to take for granted, that thoſe bad qualities of the air will cauſe an obſtruction of the perſpirable matter, in whatever manner they effect it*. And as moiſt air tends ſo much to relax the fibres, we ſhould from thence infer a farther power in it to promote putrefaction. For, whatever relaxes, diſpoſes to corruption; and whatever braces, may be conſidered as antiſeptic †.

Theſe things being premiſed, let us ſuppoſe, that in the end of ſummer or in the beginning of autumn, the perſpiration is ſtopped, or, in other words, that the moſt volatile and corrupted parts of the blood are retained in the maſs, whilſt the humours are diſpoſed to a putrid acrimony, and then we ſhall eaſily conceive how this may bring on a feveriſh heat, with all the ſymptoms of a common paroxyſm *; in which the profuſeneſs of the ſweat ſeems to depend upon the ſolution of the blood and laxity of the fibres. This not being the natural ſtate of the body in winter, it is not ſurprizing that common feveriſh heats ſhould then be more rarely relieved by ſweatings.

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* In cœnoſo (aëre) prohibetur perſpiratio, fibræ laxantur, &c. SANCTOR. Med. Stat. ſect. II. aphor. viii.

† Vid. Append. Paper III. remark after Exp. xvii.

When the ſweat is abundant the putrid parts of the blood are either wholly or in ſome degree expelled, after which the fever will either entirely be cured, abated, or brought to intermiſſions.

It is difficult to account for the periodic returns upon any principle, but perhaps eaſieſt upon that of putrefaction. The heat of the body varies little, and therefore the corruption produced in any of the humours muſt happen in a determined time, longer or ſhorter, according to the nature of that humour. The ſize or inflammatory cruſt of blood is ſoon corrupted, the *craſſamentum*, a little ſlower; but the *ſerum* remains a long time untainted in a heat equal to that of the human body †. It is to be obſerved, beſides, that things will corrupt ſooner or later in proportion to their mixture with air, to the vent they have, or to the cloſeneſs in which they are kept. The corruption of bile is quick, but not ſo high or offenſive as that of blood or the fibrous parts of the body *. Theſe things conſidered, we may conceive how there may be returns of paroxyſms at equal diſtances, and at ſhorter or longer intervals, according to the quality of the humour, its ſeat, its openneſs or confinement.

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* In autumno augetur corporis pondus; quod ſi excedat ſalubrem latitudinem, fiunt tertianæ, ſeu aliæ putridæ. SANCTOR. Med. Stat. ſect. I. aphor. cxv.

If we ſuppoſe, that in the paroxyſm the more corrupted particles of the blood do not all paſs off through the ſkin with the ſweat, but that ſome part of them are diſcharged with the bile; this in courſe coming into the inteſtines, and from thence taken up by the lacteals and carried into the blood, may there act as a new *ferment* §, and occaſion a return of the fit. Thus, the corruption of the bile may be the effect of the firſt paroxyſm, and the cauſe of thoſe that enſue. That this is ſometimes the caſe, may be deduced from hence; whenever a vomit can act ſo powerfully, ſoon after a fit, as to evacuate the gall-bladder at once, the intermittent is either wholly removed, or at leaſt made eaſier. But I would not infer from this inſtance, that the corruption of the bile was the only cauſe of ſupporting the fever, ſince there are other circumſtances that ſeem to indicate as if the firſt paſſages were ſometimes the ſeat of the putrid leaven, independent of the gall; and in continued or remitting fevers of this kind, it would appear as if the blood itſelf, not making a thorough ſeparation of the ſeptic particles, retained ſome part of them as a ferment for producing new paroxyſms.

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† Vid. append. Paper vii. Exp. xlii. * Ib. Pap. i. Exp. ii.

§ This term is only uſed to denote the putrefying cauſe.

If theſe fevers in general ariſe from a putrid cauſe, how much more ſo muſt thoſe that happen in marſhy countries, where perſpiration is not only impeded by the moiſture of the air, but where the blood is corrupted by the *effluvia* of plants, inſects and fiſhes, that die and rot in the ſtagnating water. From this ſource the fevers are not only more frequent, but alſo become of a more malignant and peſtilential nature *. Men breathing in ſuch an air are conſtantly receiving into their blood a multitude of putrid particles, which will paſs off as long as the excretions are clear; but if theſe are ſtopped, the ſeptic matter muſt infect the humours and occaſion a more than ordinary putrid diſeaſe. Hence it is that in marſhy countries, during the ſickly ſeaſon, indigeſtions, colds, or whatever tends to ſuppreſs the perſpiration, is ſo apt to occaſion a fever of this kind.

But tho' from theſe principles we may account for the common ſymptoms of the bilious fevers, yet the ſuddenneſs and violence, of thoſe that appeared in the cantonements, would ſeem to be owing to ſome other cauſe than what has been yet explained. It will, therefore, be proper to add ſome farther conjectures upon this ſubject.

When any greater quantity of putrid *effluvia*, or ſuch as are of a more virulent nature, are admitted into the blood (beſides acting upon it in a ſlower manner by way of ferment) they ſeem immediately to affect the nerves, and thereby to occaſion ſome extraordinary diſorder of the whole frame.

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* Vid. Part II. ch. ii. ſect. iii.

Hence ariſe ſpaſms, obſtructions, palpitations, a high degree of fever, or a languid circulation, chillineſs, or intenſe heat; and a variety of contrary ſymptoms, according to the different affection of the nerves. Theſe facts are ſufficiently known to thoſe who have either given attention to the accounts of the plague, or had an opportunity of ſeeing caſes of malignant and peſtilential fevers. The *delirium*, inquietude, ſinking of the pulſe before evacuations, or an uncommon regularity of it when other ſymptoms were bad, the frequent but uncritical ſweats, the great dejection of ſtrength and ſpirits, ſymptoms that appeared early and attended this fever in its worſt ſtate, were a proof of the great diſorder of the nerves; which are always the firſt parts that ſuffer from the admiſſion of any putrid *miaſmata* into the blood*. But as to the ſuddenneſs and high degree of phrenzy, which ſeized many of thoſe who fell ill in the cantonements near Bois-le-duc, we muſt aſcribe it in part to their being long expoſed to the heat of the ſun, after having taken in ſo much of a ſeptic ferment from the early fogs, through which they paſſed when they went for forrage.

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* It is obſervable what a near affinity there is even between the firſt ſymptoms of the true plague, and thoſe of the ardent fever of the marſhes. For, thus we find the former deſcribed at Aix in Provence, which received the infection from Marſeilles; *Cette maladie commence ordinairement par un froid avec douleur de tête, abattement des forces et envie de vomir, un feu brulant dans les entrailles, une ſoif inſatiable—le pouls concentré. V. Traité de la peſte, Partie* I. *p.* 217. Add to this, that the plague appeared ſometimes in the form of a double tertian: *il*

Tho' theſe ardent fevers aroſe from a cauſe not inflammatory, yet they ſoon became ſuch from the violence of the paroxyſms. For, it may be eaſily conceived, that whatever occaſions ſuch burning heats, hæmorrhages of the noſe, violent head-achs and phrenzies, muſt frequently be the cauſe of fixing the inflammation. Hence it happens, that the bilious fevers, in their greateſt rage, are always of a mixed nature, between putrid and inflammatory: a circumſtance we muſt have particular regard to in the cure. But in the decline of autumn, when the weather grows cool, the bilious or putrid cauſe is

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*il arrive, mais rarement, que le mal ſe maſque par tous les ſignes d'une fievre double tierce; et ce deguiſement dure tout au plus juſques au troiſiéme accès, et alors il ſe demaſque par tous les ſymptômes ſuſdits de peſte, tant interieurs qu' exterieurs.* Ib. p. 218.

then weakened; whereupon the fits becoming more moderate, the fever is commonly attended with little or no inflammation, is generally of a regular type, and has full intermiſſions. This was the caſe in our cantonements; and ſuch fevers are obſerved to run the ſame courſe in all other marſhy countries. But in camps, tho' in the decline of autumn, the fevers tend likewiſe more to intermiſſions, yet from the great colds the ſoldiers are at that ſeaſon more expoſed to in the field than in quarters, ſome degree of inflammation is always joined, ſufficient to prevent a thorough *apyrexia*, and to keep up the remitting form.

I ſhould now proceed to the cure, but as it may be proper to examine theſe principles, by conſidering what ſhape the diſeaſes aſſume in other places, under the influence of a warm, moiſt or putrid air, I ſhall produce a few inſtances for this purpoſe, from ſome authors who have made the moſt careful obſervations.

SECT.

## SECT. IV.

### *The Bilious Fever of the camp and cantonements compared with the ſummer and autumnal fevers of other places.*

I SHALL begin with the *morbus Hungaricus*, a diſeaſe frequently mentioned by authors; but, as I imagine, imperfectly known. It is deſcribed as a malignant fever, attended with ſickneſs at the ſtomach, a pain and hardneſs about the epigaſtric region, great thirſt from the beginning, a parched tongue, and a conſtant head-ach ending in a *delirium*. Theſe were the common ſymptoms, to which were added, for the moſt part, petechial ſpots or blotches. The diſtemper was highly contagious and mortal; tho' it uſually run out from 14 to 20 days. It was firſt taken notice of in the year 1566, when it appeared in the Imperial army in Hungary, from whence it ſpread over the greateſt part of Europe. As I have met with no author that was an eye-witneſs, I ſhall take the liberty to infer from this account, which we have from Sennertus *, that the Hungarian malady was a compound of the bilious and hoſpital fever, taking its riſe firſt in the camp, and acquiring that malignant form from the foul air of the places in which the ſick were laid. It appears from all accounts, that the climate here is one of the moſt fatal to an army during the ſummer and autumn; which is eaſily underſtood from the cold and damp nights that ſucceed the ſultry heats of the day. And ſince the autumnal fevers and fluxes are always more frequent and worſe in Hungary than elſewhere, in order to account for the exceſſive malignity and contagion of this epidemic, we need only ſuppoſe, that the weather in that year was cloſe, and more than ordinarily unwholeſome throughout all Europe, the ſick were crouded together, and the dead frequently lay unburied †. But theſe reflections will be better underſtood after conſidering the nature of the jail or hoſpital fever, to which claſs this diſeaſe may be very well referred. We ſhall, therefore, proceed

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* De Morbo Hungarico.

† This was indeed the caſe, vid. loc. cit.

to examine ſome epidemics of a leſs doubtful nature.

At Copenhagen, in the year 1652, a fever began in autumn, after an unuſually hot and dry ſummer *. This city is ſituated in a low and marſhy country. The fever was accompanied either with quotidian or tertian paroxyſms, bilious vomitings, a burning heat, violent head-achs, frequently a *delirium*: and petechial ſpots came out in the fits, but diſappeared in the remiſſions. Theſe, with an extraordinary debility, indicated the malignant nature of the diſeaſe; which was more aſcertained by its terminating in profuſe ſweats, abſceſſes, a *diarrhœa* or bloody flux. The author of this account, Thomas Bartholine, upon diſſecting the bodies, and finding the ſtomach and *duodenum* always inflamed or mortified, aſſigns theſe parts as the ſeat of all malignant fevers.

In the year 1669, a like fever raged at Leyden, deſcribed by Sylvius (De le Boe) † who lived at the time and practiſed there. The ſituation of this place is alſo low and damp.

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* BARTHOLIN Hiſtor. Anat. Rar. Cent. II. Hiſt. lvi.

† Prax. Med. Append. Tract. x.

The ſpring and beginning of ſummer were cold, but the remainder of the latter and autumn, were extremely hot, with little or no rain, and a conſtant calm or ſtagnation of the air. The water of the canals and ditches was highly corrupted; and the more ſo, as the author obſerves, by an inlet of ſalt-water mixing with the freſh *. The air being thereby rendered impure, brought on a very fatal and epidemic fever, of a remitting or intermitting form. Beſides the diſorder of the ſtomach, great anxiety, bilious vomitings, quotidian or tertian paroxyſms, and other ſymptoms, the conſtant attendants of this illneſs, he mentions ſpots, oozing of blood from the noſe and hæmorrhoidal veins, dyſenteric ſtools, putrid urine, great debility, *aphthæ*, and other appearances, which argued an extraordinary reſolution and putrefaction of the blood. And yet, what is ſtrange, the author aſcribed the cauſe to a prevailing *acid*||, and treated the diſtemper accordingly; ſo that we cannot help remarking, that the great mortality among the principal inhabitants of

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* The reaſons of this may be learned from the experiments in the appendix. Paper III. and IV.

|| Sylv. Prax. loc. cit. DCXXVII.

that city (of which two thirds died) may have been owing, in ſome meaſure, to the method of cure by abſorbents and other medicines, agreeable to the notion that celebrated Profeſſor and his followers entertained of the cauſe.

Theſe and other inſtances of a like nature confirm what was obſerved before of the great danger of hot and dry ſummers to moiſt and low countries *.

But the bilious diſeaſes are ſtill more frequent and fatal in the marſhy countries of the ſouth, where the heats are longer and more intenſe. In ſome parts of Italy and other tracts of the ſame latitude, theſe fevers have appeared with ſuch dangerous and putrid ſymptoms, that they have not only been called peſtilential, but confounded with the plague itſelf. In this ſenſe we are to underſtand Celſus †, in the terms *peſtilentia* and *febris peſtilentialis,* which he deſcribes as peculiar to the *grave anni tempus* and the *graves regiones.* His meaning is, that this bilious and malignant fever is the diſeaſe of the latter part of ſummer and of autumn, when the air is thickeſt and moſt foggy, and that it is moſt incident to low and wet countries.

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* Part I. ch i. p. 6. Part II. ch. ii. p. 100, 101.

† Vid. CELS. de medicin. Lib I. cap. x Lib. III. cap. vii.

Rome was always liable to theſe fevers. Galen calls the *hemitritæa* the epidemic of that city, and ſpeaks of its moiſt air*. Nay, in the beginning of the Republic, before the Romans ſeem to have been aware of the noxious effects of ſtagnating water, or at leaſt knew how to let it off, that place appears to have been ſo extremely ſickly, that from the beginning of the ſtate, to the year 459, I find no leſs than fifteen plagues mentioned by Livy †: which yet from other circumſtances, appear to have been only ſo many malignant and deſtructive epidemics, occaſioned by the putrid *effluvia* from the neighbouring marſhes. But when drains and common ſhores were made, the city became much more healthful; and then only the low and wet places of Latium remained ſickly. Afterwards, when the city fell into the hands of the Goths, the drains being ſtopt, and the aqueducts cut, the Roman territory became one continued marſh; which for a ſeries of years occaſioned an incredible deſolation *. And tho' theſe evils have been ſince remedied, yet ſtill, by neglecting to draw off the ſtagnating and corrupted water, after inundations of the Tyber, ſucceeded by great heats, the malignant remitting and intermitting fevers become both general and fatal. The diſſections made by Lanciſius, added to his excellent account of thoſe epidemics, are a full proof of the putrid nature of the diſeaſe †.

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* De Temperam. Lib. II.

† Others have reckoned up ſeveral more from the ſame author, Vid. LANCIS. Diſſert. de Advent. Roman. Cœli Qualit. Cap. III.

Altho' it does not appear that the countries in which Hippocrates practiſed were either marſhy or ſubject to inundations, yet, we find, he frequently mentions theſe fevers as common in ſummer and autumn; but as prevailing moſt when wet ſprings, with ſoutherly winds, were ſucceeded by hot and cloſe ſummers. A conſtitution of this kind is deſcribed in the epidemics §; at which

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* Id. loc cit.

† De nox. Palud. effluv. Lib. II. Epid. I. Cap vi.

§ Lib. III. ſect. iii.

time the diſtempers were ardent, remitting and intermitting fevers of the worſt kind, accompanied with fluxes, parotids, and eruptions upon the body of a peſtilential nature.

Proſper Alpinus obſerves, that the ſtagnating canals at Grand Cairo, breed every year a malignant kind of ſmall pox, and alſo the putrid and peſtilential fevers, that prevail in March, April and May, which the conſtant ſoutherly winds make the hotteſt months in that country *. He alſo remarks that the peſtilential fevers are both epidemic and fatal at Alexandria, in autumn, after the receſs of the Nile. Theſe begin with a nauſea, great ſickneſs at the ſtomach, extraordinary inquietude, and a vomiting of an acrid bile †: and many have bilious and putrid ſtools. Now as theſe diſtempers rage in both cities every year, it is not ſurprizing, if in ſeaſons uncommonly hot and moiſt they ſhould be raiſed to a true plague. For, altho' the learned author aſſerts, that the true plague is not properly indigenous to Egypt, but is brought thither from Greece, Syria, or the more ſou-

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* De Medicin. Ægyptior. Lib. I. cap. xiv.

† The author's phraſe is, *bilis virulenta.*

thern parts of Africa, yet he owns that it ſometimes begins here, after an extraordinary inundation of the Nile; when the water extending itſelf beyond the uſual drains, remains on the land and is there formed into putrid marſhes*.

Java, lying between 5 and 10 degrees of ſouth latitude, is ſo near the line, that the ſeaſons are not ſo properly divided into ſummer and winter, as into the dry and rainy. The rains begin in November and continue till May, in which time an immenſe quantity falls. There are alſo a great number of marſhes and canals with ſtagnating water, by the exhalation of which, the air is rendered moiſt, foggy and unhealthful. Bontius obſerves, that at this time the humidity is exceſſive, and that even in the dry months, the metals ruſt and the cloaths rot in that country ſooner than in any part of Europe. Nevertheleſs, the plague is unknown in Java, tho' from theſe circumſtances one might expect that iſland ſhould be much expoſed to it. But we may conſider, that when the ſun is moſt vertical in that country, it is alſo moſt clouded; by which means, and the continual interchanges of the ſea and land breezes, the heat of the air is conſiderably moderated, and its ſtagnation in a great meaſure prevented. The diſtempers are the *cholera*, flux, and a continued putrid fever. This laſt comes on ſuddenly, with a *delirium*, and is attended with conſtant watchfulneſs and a vomiting of a bile of various colours, but chiefly green. The extremities grow cold, whilſt the inward parts burn, the thirſt is exceſſive, but the fever comes ſoon to a *criſis*. The evacuation of the firſt paſſages is the principal part of the cure; and next to that, the author recommends ſaffron *, a medicine remarkable for an antiſeptic as well as a cordial quality †.

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* Ibid. Cap. xv.

The Britiſh ſettlements in Guinea, are as near the line on this ſide, as Java is on the other. On that coaſt, the rainy ſeaſon continues throughout April, May and June. In July and Auguſt the weather is ſultry, and remarkably moiſt and foggy, from the ſtagnating water and the woods which abound in that country. During this ſeaſon, remitting and intermitting fevers, with quotidian paroxyſms, are epidemic. Theſe are always accompanied with extreme thirſt, a nauſea, and great inquietude; frequently by a vomiting and purging of a putrid bile: and the fever does not uſually abate till that is evacuated. If a diſcharge of this humour is not made in time, the diſtemper aſſumes a continued and malignant form, the pulſe ſinks, and a *delirium* comes on, generally fatal. Fluxes are likewiſe frequent at this ſeaſon: and both fever and flux are no leſs common on board the ſhips lying off the coaſt, than on ſhore; but do not affect ſuch as keep out at ſea, beyond the limits of the foggy air. The ſea and land breezes here, with the conſtant hazineſs of the weather during the greateſt heats, ſeem to be of the ſame uſe as at Java for preventing the plague*.

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* Bont. Method. Medendi Cap. xiv.

† Apend. Paper II. Exp. xi. Pap. III. Exp. xvi.

Neither do the bilious fevers of the Weſt Indies, tho' of a very putrid nature, ever turn to a true plague; becauſe the ſame kind of breezes prevailing there, hinder that degree of ſtagnation and corruption of the air neceſſary to produce it. But the heats being great, and the atmoſphere loaded with vapours, fevers of remitting and intermitting forms, with bilious vomitings, become epidemic throughout June, July and Auguſt (April and May are always rainy months in Jamaica) and rage moſt after the wetteſt ſeaſons. Theſe fevers are incident to the natives as well as to thoſe who have lived above a year in the country. But the new-comers are liable to a continued, a more putrid and dangerous fever * ; which, tho' not confined to any certain time of the year, coincides moſtly with the former. This laſt is diſtinguiſhed by vomitings of a matter, ſometimes green and bilious, at other times black and bloody; but chiefly by the yellowneſs of the ſkin. The blood is alſo much reſolved †; ſo that, before death, it enters the

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* This account I had from an experienced ſurgeon, who lived ſome years in that country.

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* This is commonly known by the name of the *yellow fever*, or *black vomit*. The difference of theſe two is taken notice of by Dr. Warren (in his treatiſe concerning the malignant fever of Barbadoes, p. 2.) and tho' it does not appear that there was any ground to trace this laſt fever from ſome infection brought from Europe to America, yet it ſeems to be a diſeaſe of a malignant or peſtilential nature.

† This always imports putrefaction. Vid. Append. Pap. vii.

ſerous veſſels, tinging the *ſaliva* and the humour diſcharged from a bliſter *.

Before I conclude, it may be proper to take notice, that we have alſo fevers of a bilious kind in this iſland; and that both our remitting and intermitting fevers and dyſentery, ſeem no leſs the effects of a putrid cauſe than thoſe of other countries. But I muſt add, that ſuch is the drineſs of the ſoil, and its freedom from marſhes, the conſtant perflation, and the moderate and interrupted heats of our ſummers, that, unleſs in extraordinary hot and cloſe ſeaſons, and in the fenny tracts, theſe diſtempers are always gentle, and ſeldom epidemic. At the ſame time, I am apt to think, that the ſmall degree of putrid acrimony, to which our blood is liable, may be the reaſon of our overlooking it altogether, at a ſeaſon when it is moſt incident; and that, inſtead of evacuating or correcting what is amiſs, we often neglect it, till it creates ſome fixed diſorder in the *primæ viæ*, or ends in obſtructions of the *viſcera.* So that from hence may proceed ſcorbutic ſymptoms, nervous complaints without fever, or fevers of a nervous kind; inſtead of fluxes, intermitting or remitting fevers, the common conſequence of a more ſudden and thorough corruption of the humours.

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* Dr. Warren mentions many ſymptoms, indicating a putrefaction of the humours, and nervous ſpaſms conſequent thereupon.

In fine, during the latter part of ſummer, or throughout autumn, there ſeems to be in moſt places a tendency, more or leſs, to theſe remitting or intermitting diſeaſes; or to ſome diſorder of the firſt paſſages, proceeding from a reſolution of both the fluid and fibrous parts of the body. And this holds chiefly in hot and moiſt countries, and in all camps, for the reaſons already explained.

To this theory about the corruption of the humours, two objections will naturally occur; one from obſerving how readily theſe fevers, when free from inflammation, yield to the Bark; and the other, how frequently they appear in the ſpring, before there has been any heat to occaſion putrefaction. For an anſwer to the firſt difficulty, I ſhall refer to the experiments made on the antiſeptic qualities of that medicine*: but as to the ſecond, I ſhall endeavour now to remove it.

We may obſerve, that the fibres are more relaxed in the ſpring than during the winter; hence, the body becoming more plethoric, the humours will be apter to corrupt upon any ſuppreſſion of perſpiration. To this, perhaps, may contribute, the *effluvia* ariſing from all putrid ſubſtances, which being lockt up during the cold of winter, are then ſet at liberty by the greater heat of the ſun. Now, whatever are the cauſes of the vernal intermittents, it is certain, that they are never nearly ſo frequent, nor attended with ſuch malignant ſymptoms and marks of putrefaction as thoſe accompanying the autumnal. But at the ſame time, it muſt be acknowledged, that whether they are all owing to a ſeptic cauſe or not, in the worſt kinds we have reaſon to apprehend all the bad conſequences of it.

Upon the ſame principles we may account for the diſappearing of theſe diſeaſes in the be-

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[*] Append. towards the concluſion of Paper II.

ginning of ſummer. For, the perſpiration being then more plentiful and conſtant, the redundant humours are diſcharged; and the ſun having exhaled all that was putrid, has not yet heat enough to corrupt the ſtagnating water.

All theſe vernal remittents are attended with great ſizineſs of blood, from the colds taken upon the firſt encampment: ſo that both the firſt and laſt fevers of the campaign are, on this account, to be conſidered as more of an inflammatory than a bilious or putrid nature.

## SECT. V.

## *Of the Cure of the Bilious Fever of the camp, and of low and marſhy countries.*

I Come now to the cure, in treating of which I ſhall obſerve the following method. In the firſt place, I ſhall diſtinguiſh the two *ſpecies* of fevers, as before; and then I ſhall mention ſuch remedies as I have found moſt ſucceſsful, forming rules from my practice only, independent of any theory. For, tho' it is uſual to take the indications of cure from the nature of the diſeaſe, yet as I have deduced the preceding theory rather from the cure, than the cure from it, it ſeems juſt to offer this part as the reſult of experience alone.

I. THE cure of the *camp fever*, before it becomes continued, depends upon the proper uſe of evacuations, the neutral ſalts and the Bark. Bleeding being indiſpenſible, it is the firſt thing to be done in every caſe, and is to be repeated once or oftner, according to the urgency of the diſtemper. The vernal and latter autumnal remittents are accompanied with pleuritic and rheumatic pains, and other ſymptoms of high inflammation; and on that account require more bleedings than what is neceſſary in the intermediate ſeaſon. A perſon unacquainted with the nature of the diſeaſe, and attending chiefly to the paroxyſms and remiſſions, may be apt to omit this evacuation, and to give the Bark too ſoon, which would bring on a continued inflammatory fever. A vein may be ſafely opened either during the remiſſion, or in the height of a paroxyſm. For, beſides that I have obſerved the remiſſion to come ſooner and fuller after an hæmorrhage, I have repeated experience of the ſafety of bleeding in the hot fits; and not only in this, but in the *marſh fever*, even after it comes to almoſt regular intermiſſions. In order, therefore, to make Celſus's maxim* conſiſtent with this practice, we muſt interpret the term *impetus febris* in the ſenſe of that chillineſs or cold fit that preceded the paroxyſms of thoſe fevers he deſcribes: at which time bleeding might indeed be improper. But as the paroxyſms of our fever generally appeared without any cold fit, that caution was not to be minded; nor any other, except the common one, of not bleeding during the ſweat.

After the bleeding it was neceſſary to give an emetic; and the beſt time was in the remiſſion or intermiſſion of the fever; and rather ſoon after a paroxyſm than before one. There is ſome difficulty in determining the kind of vomit; and ſometimes it may be doubtful whether any is proper or not. Vomits do harm when the ſtomach is inflamed, or whenever the fever has been of ſome ſtanding and aſſumed a continued form. But withal, it muſt be obſerved, that an inflammation of the ſtomach is a rarer occurrence than one would imagine, amidſt ſo many complaints of vomiting, pain, ſickneſs and oppreſſion about the epigaſtric region; all which being commonly relieved by the emetic, we may ſafely give one whenever the fever intermits, or is attended with conſiderable remiſſions. *Ipecacuanha* is the ſafeſt and eaſieſt, but the antimonials are the moſt efficacious. If the remiſſions are ſmall, or the fever great, or if there is already a tendency to vomit, the root is beſt; but whenever the remiſſions are diſtinct, or the intermiſſions perfect, the other are preferable, either by themſelves or joined to the former. I commonly added two grains of *tartar* emetic to a ſcruple of the powder. Thoſe vomits, which are alſo productive of ſtools, are the moſt uſeful; but eſpecially if they are powerful enough to produce a plentiful diſcharge, upwards or downwards, of the corrupted bile. By this means they ſometimes effect a cure without farther medicines.

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* Quod ſi vehemens febris urget, in ipſo impetu ejus ſanguinem mittere, hominem jugulare eſt. De Med. Lib. II. cap. x.

But if the body remains coſtive, it is neceſſary to open it with ſome lenient phyſic, and eſpecially if the bowels are affected with pains or a *teneſmus*.

The neutral ſalts are uſeful in bringing the fever ſooner to regular intermiſſions. The ſaline draught, with ſalt of wormwood and lemon juice, is one of the beſt forms for this intention, but too coſtly for common practice; and therefore, in lieu of them, we have uſed the following mixture:

℞ *Sal. Abſinth.* ʒi. *ſolv. in Aq. fontan.* ℥vii. *et inſtill. Sp. Vitriol. q. ſ. ad ſaturat. add. Aq. alexeter. ſp.* & *Syr. e Cort. Aurant.* āā. ℥ß. *Cap. quarta vel ſexta quaque hora cochl.* iv.

The *Spir. Mindereri* may be given to the quantity of an ounce or more (divided into two or three draughts) whenever the ſweats are not profuſe enough in proportion to the fits: and the proper time for adminiſtring this medicine is before they go off. As it promotes a plentiful *diaphoreſis* without heating, we may expect it will bring the fever ſooner to regular intermiſſions.

I come next to the Bark, and ſhall obſerve, that tho' theſe fevers are never without inflammation in the beginning, and rarely have complete paroxyſms; yet, when the urine *breaks*, and there are entire tho' ſhort intermiſſions, it may be ſafely given. I have taken notice how readily this diſeaſe put on a continued inflammatory ſhape, upon giving the Bark before bleeding; I ſhall add, that it was no leſs dangerous to preſcribe it before the *firſt paſſages* were cleared: for, without this precaution, either the fever returned, or a *tympanitis* was brought on. The Bark anſwers beſt in ſubſtance, infuſed in Rheniſh wine; but for common practice it was made into an electuary, in which, to an ounce of the powder, a drachm of crude *Sal Ammoniacum* was added. If the patient was not purged, I found it neceſſary to join as much rhubarb as kept the body open, for the firſt two or three days of uſing that medicine. This practice is recommended by Lanciſius * and

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* De Nox. Palud. Effluv. Lib. II. Epidem. IV. cap. vi. ſect. xxvi. et TRAVERSAR. Ep. ad LANCIS. lb. Epidem. IV. cap. viii. ſect. xxi.

Dr. Mead †, and is chiefly uſeful when the bilious humours abound, as they moſtly do in marſhy countries. As the paroxyſms were generally quotidian, and the intermiſſions ſhort, it was ſometimes neceſſary to begin the Bark before the ſweat was quite over, in order to prevent a return.

Theſe are the chief rules to be obſerved in the beginning of the fever, or in its continued form, before the remiſſions appear; as alſo in its remitting and intermitting ſtate. But if the diſeaſe has been neglected in the firſt ſtages, or if, after remiſſions or intermiſſions, it changes into a continued fever, a vein muſt be opened, if the pulſe is full and hard; but if the head is affected, either with a *delirium* or pain, and the pulſe is ſmall, it will be more expedient to apply leeches to the temples. But, whether there is place for bleeding or no, bliſters are not only uſeful, but the beſt remedy. At this time, neither vomits nor purges are proper, however the *primæ viæ* may be loaded; but clyſters or ſome lenient phyſic are neceſſary for evacuations, tho' theſe are not to be repeated without caution. To theſe remedies ſhould be added the neutral ſalts, either ſuch as have been juſt mentioned, or the diaphoretic powders or mixture preſcribed in the firſt chapter of this Part.

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† Monit. et Præcept. Medic. Cap. I. ſect. viii.

But tho' a ſweat be the proper *criſis*, we are never to move it by the *theriaca*, volatiles, or the like hot medicines; unleſs the pulſe ſhould ſink, and the *petechiæ*, or other bad ſymptoms appear: in which caſe it will be neceſſary to uſe the warmer alexipharmacs, and to treat the diſeaſe like (what it is in effect) a malignant fever.

Sometimes it changes into a dyſentery, to be managed in the manner directed in a ſubſequent chapter *. But if a *diarrhœa* comes on, (tho' this is never to be ſtopt ſuddenly) it will often be convenient to reſtrain it gradually by opiates, and afterwards to promote a *diaphoreſis*. If the pulſe ſinks with the frequent ſtools, the *theriaca* and *ſerpentaria* may be given, but with a leſs proportion of the firſt than in Fuller's decoction ||. Tho' a looſeneſs is the leaſt favourable *criſis*, yet if nature points this way (by colic pains or a tenſion of the belly, attended with a drineſs of the ſkin) it will be proper to procure ſtools by a clyſter, or ſome other gentle laxative, ſuch as an infuſion of rhubarb with *manna*, to be repeated according as the patient can bear the evacuation.

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* Ch. vi. || Decoct. Serpent. comp Ph. Edinb.

II. The *camp* and *marſh fevers* are not more alike in the ſymptoms than in the cure. The rules, therefore, laid down in the preceding paragraphs being applicable to both, I ſhall only offer a few cautions concerning thoſe points in which they ſeem moſt to differ. When the fever of the marſhes is of an ardent kind, they require large bleeding; but in general, as the humours have here a very putrid tendency, this fever admits leſs of this evacuation than that of the camp, where from frequent and great colds the blood becomes more ſizy, and the inflammation more fixed. In moſt caſes, it was neceſſary to open a vein, either on the firſt attack or the next day, if there was no intermiſſion. But repeated bleedings, unleſs upon evident marks of inflammation *, were ſo far from producing this effect, that they were apt to render the fever more malignant. It will alſo be proper to remark, that the foregoing rule about the neceſſity of bleeding regards the army only, and not the inhabitants of that country; as their conſtitutions may be different from the generality of our men, who, for the moſt part, were young, ſanguine and robuſt. And even amongſt theſe, the bleeding was not always neceſſary upon a relapſe, or after the weather grew cool, when the fever appeared without inflammation, and with perfect intermiſſions.

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* As in the caſe of thoſe, who, in the cantonements near Bois-le-duc, during the heat of the ſeaſon, were ſuddenly ſeized with a high fever and *delirium*.

I obſerved, that vomits were ſtill more efficacious here than in the camp; in ſo much, that when the bile was thoroughly evacuated by an emetic, the fever would often be removed. But this effect was not to be obtained by the *Ipecacuanha* alone, which I have ſeen have a contrary effect in making the enſuing paroxyſms longer and more violent than the preceding: whether by acting weakly, and ſending more of the corrupted humours into the blood than it diſcharged from the *primæ viæ*, or from ſome other cauſe, is uncertain. For this reaſon I commonly added the emetic *tartar*.

This fever, during the warm ſeaſon, being more apt to run into double paroxyſms, or to change into a continued form, than to remain in the intermitting ſhape, it was, therefore, neceſſary, after due preparation, to ſtop it in the firſt fair intermiſſion. And for this purpoſe, the Bark was found to be no leſs ſpecific with our men in thoſe parts, than at home. But I muſt add, that tho' large quantities were given, relapſes were not only frequent, but certain, if the medicine was not repeated oftner than the ſoldiers could be prevailed upon to take it. So that, upon the whole, the Bark was leſs uſeful than what might have been expected in ſuch circumſtances. But it will be proper to obſerve, that no bad conſequence aroſe from repeating it often; for, the viſceral obſtructions that ſucceeded to theſe fevers, were not to be imputed to the quantity of the Bark, but to a long continuance of the diſeaſe, or to frequent relapſes: againſt which there was no ſecurity, unleſs the patient continued to take an ounce of it once every ten or twelve days throughout

out the autumn. The moſt effectual way to make a ſoldier uſe this medicine, in order to prevent a relapſe, is to infuſe it in ſpirits.

The next means of prevention conſiſts in a proper regulation of diet. The convaleſcents muſt eat moderately, eſpecially of greens, and are to abſtain from fruit, new ſmall beer, and whatever is flatulent or tends to relax. For, as we obſerved before, whatever produces that effect, diſpoſes to putrefaction; and, on the contrary, whatever braces, is antiſeptic *. A moderate uſe of gin or brandy is at this time neceſſary; but as a ſoldier's pay is inſufficient in the marſhy countries for providing both wholeſome food and ſtrong liquor, it would be proper, that the public ſhould make, at ſuch times, an allowance of ſpirits to the army, as it does to the navy: tho', perhaps, half that quantity might be ſufficient. The beer and water are there both bad, and diſpoſe to relapſes, unleſs qualified in this manner.

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* Page 217.

CHAP.

## CHAP. V.

## *Of the Cure of Obſtructions, conſequent on the Bilious Fever of the camp and marſhy countries.*

A Long continuance of theſe fevers, or frequent relapſes into them, bring on viſceral obſtructions, ending in a dropſy or jaundice.

The dropſies are chiefly owing to obſtructions of the liver and ſpleen; in which caſe the ſwelling generally begins at the feet, and riſes gradually to the belly. But when this alone is ſwelled, and that ſuddenly after the unſeaſonable uſe of opiates in the dyſentery, or of the Bark in intermittents, the diſtemper is a true *tympanitis*.

In this malady, if the patient is feveriſh or full of blood, begin with bleeding; if not, it will be ſufficient to give every night a ſmall doſe of rhubarb (juſt enough to keep the body open) with a few grains of the *ſpecies aromaticæ*. After the ſwelling gives way, ſome ſtrengthening medicine is to be added, in this manner:

℞ *Flor. Chammæl* ʒij. *contund. cum Syr. e*
*Cort. Aurant. q. ſ. ut f. cum Zinzib.*
*pulv.* ʒij. *Chalyb. cum Sulph. præp.* ʒi.
*Electar. Cap. bis die mol. nuc. moſch. maj.*

All ſtrong phyſic, or carminatives without laxatives, are hurtful.

A man who had been ſome weeks ill of this diſtemper died ſuddenly, upon the ſwelling of the belly ſubſiding after three or four looſe ſtools. Upon opening the body, neither air nor water were found in the cavity of the *abdomen*, but the *colon* was ſo large and relaxed, that it ſeemed to have contained enough of wind to have been the cauſe of the tumour. This caſe ſuggeſted the neceſſity of uſing a ſwathe in the *tympanitis*; by means of which the patient may always make a compreſſion ſuitable to the decreaſe of the air in his bowels.

The *aſcites* comes on more ſlowly, and is generally accompanied with anaſarcous ſwellings, a paucity and thickneſs of urine. Sometimes the fever goes off when the ſwelling begins, at other times it continues, or comes and goes in an irregular manner. Theſe dropſies are not to be cured by purging alone, nor by ſoap, nor mercurials; but chiefly by the lixivial ſalts, either in the form of broom aſhes, ſalt of wormwood, or ſalt of *tartar*. The common method was this: about thirty or forty grains of ſalt of *tartar* were diſſolved in an infuſion of wormwood, to which was added ſpirit of juniper; and this mixture was taken at three doſes and repeated daily. The patient had no other medicine, but once in four or five days half a drachm of *Pilulæ ex Colocynthide cum Aloë* for a purge: and in the decline of the diſeaſe, ſome common chalybeate. Sometimes the *diureſis* was promoted by ſwallowing garlick, or muſtard-ſeed. Tho' the *aſcites* was accompanied with the hard ſwelling formerly mentioned *, nothing was farther done except ſometimes fomenting the part, or covering it with a warm plaiſter. Irregular and obſtinate intermittents have been removed by the ſame medicines: or, if they returned after the cure of the dropſy, they were then ſucceſsfully treated with the Bark.

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* Ch. iv. ſect. ii. p. 213.

The jaundice without fever was likewiſe cured by the lixivial ſalts, and the ſame phyſic. Both in this diſtemper and in the dropſy I have obſerved good effects from antimonial vomits.

## CHAP. VI.

### *Obſervations on the* CAMP DYSENTERY.

THE bilious diſeaſes of the camp were divided into fevers and fluxes; of the firſt I have treated at large; but as to the laſt I ſhall confine myſelf to that *ſpecies* called the Dyſentery, as it is the leaſt known out of the field, but often general and fatal there. I ſhall firſt deſcribe the diſtemper, and then give an account of the diſſections of ſome who died of it; after which, I ſhall enquire into its nature and cauſe; and laſtly propoſe the cure.

SECT.

## SECT. I.

### *A Deſcription of the Camp Dyſentery.*

SOME dyſenteries appear upon firſt taking the field, but the caſes are never ſo bad, nor nearly ſo frequent as towards the cloſe of ſummer, or in the beginning of autumn. At that time, they become epidemic and contagious, prevail for about ſix weeks or two months, and then ceaſe. They are always worſe after hot and cloſe ſummers, eſpecially in fixed camps, or when the men lie wet after a march in warm weather.

The conſtant diagnoſtics of the dyſentery are ſmall but frequent ſtools of a ſlimy and frothy matter, a *teneſmus* and gripes. Blood mixed with the *fæces* is a common, but not an inſeparable ſymptom; for many have all the other marks without it, at leaſt in the beginning; and others have blood in their ſtools from various cauſes, without a dyſentery. But, whereas this diſeaſe is uſually accompanied with it, for that reaſon, it has the name of the bloody-flux.

The other ſymptoms are more caſual. Sometimes a bilious fever terminates in this flux; at other times the previous fever is inconſiderable; and now and then we ſhall find the dyſentery begin without any. In general, the fever attending the flux is of little conſequence, till the diſtemper has continued long, and the patient is exhauſted; then it is of a low and malignant kind.

The firſt ſtools are uſually large and bilious, afterwards they are ſmall but frequent, conſiſting chiefly of *mucus* mixed with blood.

Streaks of blood denote the rupture of ſome ſmall veſſels in the *rectum*, but a more intimate mixture, is a ſign that the blood comes from a higher ſource. This, which alarms moſt, is the ſymptom leaſt to be dreaded; for tho' the oozing is conſtant, excepting a few caſes, the quantity of blood loſt in the courſe of the diſeaſe is inconſiderable. Upon the approach of death the ſtools become leſs bloody, that is, leſs red; for the blood is then converted into a putrid *ichor*.

In general, tho' the motions are frequent, yet the evacuation of humours is ſmall; except in the advanced ſtate of the diſeaſe, when a lientery ſupervenes, in which the aliment paſſes through undigeſted. The ſtools, therefore, conſiſt chiefly of *mucus*, which being removed from the inteſtines, the villous coat is abraded and at laſt voided. Beſides, we ſhall ſometimes, tho' leſs frequently, find in the *fæces* certain ſubſtances like bits of ſuet; and ſometimes ſmall hardened *ſcybala*, or round worms. And as neither of theſe two laſt come away at once, or appear in the beginning, they keep up the irritation and protract the diſeaſe, when it would otherwiſe have ceaſed. Theſe are the chief ſubſtances to be diſtinguiſhed in the ſtools of thoſe who labour under a true dyſentery; for, whenever purulent matter is voided at firſt, or unmix'd, it is a ſign the diſtemper is of a different kind. The inteſtines, however, are liable to ulcerate here, but ſo late that the matter is changed into a putrid *ſanies*, or ſo blended with blood and *mucus* as not to be ſeen.

The *fæces* have all along a putrid ſmell, and when the mortification begins they become cadaverous, and are then moſt infectious. The gripes are generally vague, but ſometimes there is a fixed ſpaſm in ſome one part, cauſing exquiſite pain. Altho' a great deal of wind is evacuated, yet as it is immediately regenerated, the gripes and *borborygmi* are almoſt inceſſant. All the ſtools are preceded by violent gripings, after which there is ſome little reſpite: but the motions being ſo frequent, the patient can have no conſiderable eaſe unleſs from opiates, ſweating, fomenting the belly, or after a purge.

The ſtomach is uſually affected at firſt with a *nauſea* and oppreſſion; and tho' it is generally relieved by vomiting, yet the indigeſtion continues, by which all kinds of food turning either ſour or putrid, more wind is produced and the gripes continued. A hiccup ariſes ſometimes from this cauſe, and then it is little to be dreaded; but in the low or advanced ſtate of the diſeaſe, when that ſupervenes, it is the fatal ſign of a beginning mortification.

The falling down of the gut is a conſequence of the *teneſmus*; and a ſtrangury, of the irritation of the neighbouring parts. The diſtemper ends in a proſtration of ſtrength, a low and malignant fever, ſore throat or *aphthæ*, involuntary and cadaverous ſtools, and laſt of all, in a releaſe from pain, with all the ſigns of a mortification of the bowels.

The duration and iſſue of the dyſentery are uncertain, as ſo much depends upon medicine, good air, attendance, and the care the patient takes of himſelf. If nothing is wanting and the diſeaſe recent, it may be eaſily cured: but theſe favouring circumſtances can only concur amongſt officers. The caſe is different with common men, who not only apply late for aſſiſtance, but are either expoſed to colds in the field, or, what is worſe, ſhut up in the foul air of an hoſpital. Add to this, that no diſtemper is more ſubject to a relapſe; and that frequent relapſes bring on an habitual *diarrhœa*, by relaxing the tone of the inteſtines, and eroding their villous coat.

## SECT. II.

### *Of the Diſſections.*

HAVING deſcribed the diſeaſe, I ſhall next relate the changes I have obſerved in the bodies of thoſe who died of it.

1. In autumn 1744, a ſoldier, after having been ill of the bloody flux for about three weeks, was ſent, with ſome other ſick, from Tournay to the hoſpital at Bruſſels. His pulſe was low, his ſtrength waſted, the gripes and *teneſmus* were violent and inceſſant, and his ſtools were no longer bloody, but of an ichorous colour. On the third day after his arrival, the pains abated, his pulſe ſunk, the extremities grew cold, a ſlight *delirium* ſucceeded, and he died next day.

Upon opening the body, I found the larger inteſtines black and putrid, the coats præter-naturally thick, and on the inſide much ulcerated, eſpecially in the *rectum* and lower part of the *colon*. The villous coat was either wholly abraded, or changed into a corrupted ſlimy ſubſtance, of a greeniſh colour; not only in the part deſcribed, but alſo in the *cæcum* and its *appendix*. But theſe were leſs corrupted, and the ſmaller inteſtines and ſtomach were neither mortified nor diſcoloured, but only diſtended with air. The fat of the *omentum* was greeniſh. Neither the liver nor ſpleen were tainted, but the bile was thick and ropy, and of a dark hue. That part of the *vena cava* which lay on the *vertebræ* of the loins was extremely tender. The lungs adhered a little to the left ſide, but were otherwiſe ſound. In the right ventricle of the heart, the blood was wholly clotted; but in the larger veſſels it was partly fluid, and of a blackiſh colour.

2. About the ſame time, a ſoldier of the Train, after recovering of a common flux, was ſeized with a dyſentery upon drinking, whilſt hot, on a march, an immoderate quantity of ſome cold liquor. Three days after he was brought into the hoſpital extremely ill, and beſides the common ſymptoms, he complained of the piles and gravel. This man could not lie down, but continually ſupported himſelf on his knees and hands, leaning his head forward upon the bolſter, till he died, which happened three or four days after admiſſion.

Upon opening the *abdomen*, I obſerved, that the greateſt part of the *omentum* lay over to the left ſide, under the ſmaller inteſtines; but that it was large and full of fat. The liver was ſmall and ſound; but the gall-bladder was of an uncommon ſize, and full of a dark coloured bile, thin, but ſomewhat curdled. The bilary ducts were clear. The *pancreas* was in a natural ſtate. The ſpleen, tho' of a common ſhape, was of an extraordinary bulk, being little leſs than the liver, and weighed three pounds eleven ounces: but it was otherwiſe ſound, without indentations, having only upon the ſide next to the blood veſſels, a ſmall protuberance like the *portæ* of the liver. The kidneys were ſmall and flaccid, and the *pelvis* of both, eſpecially that of the left ſide, was larger than common: and both theſe and the bladder, which was in a corrupted ſtate, contained ſome urine, but neither ſtone nor gravel. The *rectum* was extremely putrid; and from thence the gangrene ſeemed to have ſpread to the *colon*, which was entirely mortified, but chiefly towards its lower end. The villous coat was partly conſumed, and what remained was blackiſh, tender and eaſily ſeparated. The vaſcular coat had the appearance of a preparation well injected with wax. The ligaments which contract the *colon* and form the cells, were half corrupted, and adhered looſely to the outer coat. Part of the *cæ-*

*cum* was alſo mortified; but the reſt, with the ſmaller inteſtines, were of a firmer texture, and only inflamed: both theſe and the ſtomach were full of air. It was remarkable, that, notwithſtanding this diſeaſed ſtate of the bowels, no part of them was ulcerated. The cavity of the *thorax* was uncommonly ſmall; for the convex part of the diaphragm reached as high as the inſertion of the third rib into the *ſternum*. The lungs were, nevertheleſs, ſound. The heart was large, and contained in its right ventricle coagulated blood, of a coriaceous firmneſs, which did not adhere to the ſides, but was entangled with the tendinous fibres of the *valvulæ ſemilunares* which paſſed through it. Both the *ſinuſes* were full of blood, partly congealed and partly fluid, but very black.

3. In the ſame ſeaſon, a foot ſoldier was ſent into the hoſpital, ſuppoſed ill of a dropſy. His belly was much diſtended, but the tumour was greateſt above the navel. He complained of a difficulty in breathing; his ancles were alſo a little ſwelled, but he made water freely. His cheeks were florid; but the reſt of the face was pale. By his own account,

count, he had been taken ill of a bloody flux about three weeks before, which being ſuddenly ſtopt by ſome drug, given him in the camp, his belly began to ſwell.

This man, ſoon after he was admitted was ſeized with an inflammatory fever, of which he recovered, and then took ſuch medicines as were judged proper for curing a *tympanitis*; during the courſe of which, a looſeneſs coming on ſuddenly, one night, his belly ſubſided all at once, and he died before the morning.

The body was opened about thirty hours after; but during that time ſo much air was generated, that the belly had ſwelled again, tho' not ſo much as before. There was no air and ſcarce two ſpoonfuls of water in the cavity of the *abdomen*; but all the inteſtines were much inflated, except the *colon*; which, tho' then flaccid, was large enough to have contained all the air which at firſt had made the tumour. The ligaments of this gut were either deſtroyed, or ſo relaxed, that the diviſions of the cells were obliterated, but no part of the inteſtines were either mortified or inflamed. The liver was of an extraordinary bulk, reaching almoſt to the navel and ſpleen, and weighed about ten pounds. Its ſubſtance was tender, and in the poſterior part next the diaphragm, was found a large abſceſs. The gall-bladder was of a moderate ſize, and full of thin darkiſh bile. The lungs were ſound. I found little or no water in the *thorax*, but more *ſerum* than uſual in the *pericardium*. The heart was ſmall, without any clot, or even almoſt a drop of blood in the ventricles. This circumſtance confirmed me in the conjecture I formed about the cauſe of this man's death; which I aſcribed to the ſudden derivation of the blood into the *aorta deſcendens*, from the air ceaſing to compreſs it.

4. Some time later in the ſeaſon, a ſoldier was received into the hoſpital about the twentieth day of a malignant fever, ſucceeding a dyſentery. His pulſe was then low, his tongue parched, his cheeks florid, but his body waſted. He complained of great debility, of pain in his bowels, of a looſeneſs and retchings to vomit. In a few days after he was ſeized with a hiccup and died.

Tho' the body was opened the next day, the ſmell was intolerable. The inteſtines were wholly mortified, and the ſtomach partly ſo. The outward coat of the liver was alſo putrid, and in the ſubſtance were ſeveral abſceſſes, containing a purulent or ichorous matter. The ſpleen was likewiſe corrupted; but the kidneys, heart and lungs appeared to be ſound.

Theſe were the only diſſections made of thoſe who died of the dyſentery, or ſoon after it. For, tho' I wanted not opportunity of opening more bodies, yet finding theſe caſes agree ſo well with the obſervations of thoſe authors collected by Bonetus *, I thought it unneceſſary to purſue the enquiry farther, eſpecially as there were enough to aſcertain the putrid nature of the diſeaſe in its laſt period; and that no number of diſſections of perſons dying after it had continued long, could determine the firſt morbific cauſe.

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* *Sepulchr. Anatom. Lib.* III. *ſect.* xi. I find the ſame confirmed by ſome late diſſections mentioned by Mr. Cleghorn. See his obſervations on the epidemic diſeaſes of Minorca. p. 227.

SECT.

## SECT. III.

### *Of the Nature and Cauſe of the Dyſentery.*

THE remote, external and prædiſpoſing cauſes having been already explained †, I ſhall not repeat them here, but proceed to enquire into the internal and more immediate cauſe which is leſs obvious. I ſhall omit the many conjectures of others on this head, and only mention what ſeems to me moſt probable to account for the various ſymptoms of this diſeaſe.

It ſeems, therefore, reaſonable to believe, that the dyſentery is owing to a cauſe little different from what produces the bilious fevers already deſcribed. The antients deduced both from an abounding and corrupted bile: but how far this opinion was true, and how it was to be qualified in regard to fevers, has been already ſaid *. I ſhall only add, that in both caſes the vitiated humours may be turned upon the *primæ viæ*. Theſe in the lacſmaller inteſtines, may be abſorbed by the lacteals, and after producing a paroxyſm, be partly diſcharged by ſweat. But if the putrid *fomes* is conveyed to the *cæcum* and *colon*, it can neither be well abſorbed nor removed from thence, on account of the *rugæ* cells and flexures of thoſe parts. The firſt caſe gives an idea of a remitting or intermitting fever; and the laſt of a flux.

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† Part I. ch iii. p. 24, and ſeq. Part II. ch. i. p. 93. Ch. ii. ſect. i. ii. and iii.

* Vid. Part II. ch. i. p. 91. Part III. ch. v. ſect. iv.

But however this be, it is plain that there is at firſt little difference between the cauſes of the two, conſidering that the fevers begin to be frequent in camp whilſt the dyſentery ſtill ſubſiſts; that the diſtempers ſometimes change into one another; that when any number of men are expoſed to colds in autumn, part will be ſeized with a remitting fever, others with this flux, and perhaps a third ſort will have a diſorder compounded of both. Add to this, that the firſt ſymptoms are ſimilar, and that epidemic remitting and intermitting fevers of a more malignant kind have often ended in a bloody flux *. Laſtly, that ſuch countries as are moſt ſubject to bilious fevers, are likewiſe moſt liable to the other.

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* THOM. BARTHOLIN. Hiſt. Anatom. Cent. II. hiſt. lvi.

All authors agree in aſcribing it to an acrimony; but what that acrimony is, they either have not defined at all, or ſeem commonly to have miſtaken. It appears to be of the putrid kind: which has been the leſs attended to, from a notion, that the humours would become more offenſive by putrefaction than, from what is voided, they have obſerved to be the caſe. But in anſwer to this it may be remarked, that theſe humours, tho' putrid, are leſs offenſive than moſt other animal ſubſtances in the ſame condition. Farther, that this malady is moſt frequent in hot, cloſe and moiſt ſeaſons, when bodies are moſt ſubject to putrefaction; and that it prevails chiefly among ſuch as are of a ſcorbutic habit, or the meaneſt and pooreſt people, who, from foul air, bad diet and naſtineſs, are moſt liable to putrid diſeaſes. There is alſo an old obſervation, that ſuch ſeaſons as produce moſt flies, caterpillars and other inſects, (whoſe increaſe depends ſo much upon heat and corruption) have likewiſe been the moſt productive of dyſenteries. Laſtly, that the in-

infection is evidently communicated by the *fæces* of thoſe who are ill of the diſtemper.

For, the dyſentery may proceed from two cauſes, different in appearance, but in effect the ſame: one, from acrimony generated within the body; and the other, from foul ſteams, which being received into it, act as a ferment, and ſuddenly produce the ſame diſorder with what ariſes more ſlowly from an internal cauſe. A remarkable caſe once occurred to me, of a perſon ſeized with a true dyſentery, upon ſmelling to human blood, become putrid by ſtanding ſome months in a cloſe vial.

At firſt the ſmaller inteſtines ſeem chiefly affected; but upon the humour deſcending to the *colon* and *rectum*, and ſtagnating there, the corruption increaſes; ſo that the parts inflame and mortify at a time when, perhaps, the bile is no longer putrid, nor the higher inteſtines the ſeat of the diſeaſe.

The putrefaction will alſo account for the great flatulence attending this diſtemper. For, corrupted animal ſubſtances not only yield air of themſelves, but occaſion, as will be ſhewn elſewhere *, violent fermentations in all vegetable aliments. Hence ariſes ſuch a quantity of air, that if it be pent up by opiates, it will be apt to diſtend the bowels and bring on a tympany.

The frequency of the ſtools may ſeem to argue an increaſe of the periſtaltic motion; but it is to be imagined, that tho' this is quickened by the conſtancy of the *ſtimulus*, it muſt prove, on the whole, leſs expulſive, from the inability of the fibres to contract, after being ſo much relaxed by putrefaction. Of this, the *ſcybala* above mentioned are a proof, as they cannot well be formed during ſo thin a diet and ſuch frequent evacuations. It is therefore more probable, that they exiſt from the beginning of the diſeaſe, and are not expelled till after the tone of the inteſtines is ſufficiently reſtored. Hence they are chiefly found in a convaleſcent ſtate; tho' it often happens, that the coming away of theſe ſubſtances renews the irritation, and makes the *teneſmus* as bad as ever.

By a long continuance of the dyſentery, the villous coat of the inteſtines is corroded, and the reſt grow thicker by inflammation. Add to this, that when the ligaments of the *colon* give way, the *rugæ* and cells are loſt, and the caſe ends in a lientery or habitual *diarrhœa*.

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* Append. Pap. V. Exp. xxxvi.

The firſt blood probably oozes from the extremity of the *rectum*, where ſome ſmall veſſels are broke by ſtraining; but afterwards, upon the deſtruction of the villous coat, the hæmorrhage may come from any part of the *colon* or *rectum*, in a greater or ſmaller quantity, according to the ſize of the veſſels. Now this blood being ſuſceptible of a high degree of putrefaction, if not ſpeedily evacuated, may, as Hoffman well obſerves, conſiderably increaſe the diſeaſe *.

The mortification of the bowels is generally preceded by a ſlow fever, occaſioned by an abſorption of the putrid matter; and this happens ofteneſt when the air is infectious. At this period the diſtemper is moſt contagious, whether in producing a ſimple dyſentery, or one combined with the common hoſpital fever.

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* Syſt. Med. Rat. Part. III. ſect. ii. cap. vii.

The putrid nature and contagion of the dyſentery ranks it with the malignant or peſtilential diſeaſes. I have never ſeen cauſe to diſtinguiſh it into the *benign* and *malignant ſpecies*, as almoſt every caſe tends to a putrid fever or mortification of the bowels. This, indeed, muſt be allowed, that ſuch dyſenteries as occur in the ſpring, are, like the fevers of that ſeaſon, attended with more inflammation and leſs putrefaction; and that moſt caſes, if taken at firſt, and properly managed, take a favourable turn. But in general, ſuch is the ſeverity and obſtinacy of the diſeaſe when it is once formed, that it can hardly ever be called *benign*.

Laſtly, as to the diſtinction ſome have made between the dyſentery of the camp and that of other places, I muſt obſerve, that after peruſing the accounts of ſeveral practitioners in towns in various climates, I have found no material difference among them. For, if ſometimes it is more fatal in armies than in cities, it is not ſo much from any extraordinary virulence, as from the want of neceſſaries, and from the peſtilential nature that all ſuch diſtempers aſſume in foul and crouded hoſpitals.

## SECT. IV.

### *Of the Cure.*

THERE are few diſorders leſs beholden to nature for a cure, or attended with more deceitful indications. The hæmorrhage ſeems to require repeated bleedings and ſtyptics; the flux, ſtrong aſtringents; and the pains of the bowels, conſtant opiates: and yet unleſs theſe remedies are uſed with extreme caution, they tend more to augment than cure the diſeaſe. On the other hand, emetics and purges have formerly either been wholly condemned or too ſparingly uſed: yet later experience ſhews them to be the chief parts of the cure.

We may diſtinguiſh the dyſentery into three ſtates, *viz.* the firſt, when recent; the ſecond, when it has continued for ſometime, and has already impaired the ſtrength, weakened the tone of the inteſtines, and abraded their villous coat; and the third, when either from the putrid *fomes* within the body, or the foul air of the hoſpital, a malignant fever is joined, and a mortification threatned.

In the firſt ſtage, it is proper to begin with bleeding, tho' at the ſame time it may be true that a dyſentery, of itſelf, does not require that evacuation[*]. But as this diſorder is ſo often accompanied either with a *plethora*, or inflammatory ſymptoms, bleeding is frequently indiſpenſible, and always conducive to the cure[†]. Yet unleſs the firſt blood is ſizy, and the fever kept up by ſome extraordinary inflammation, repetitions are either needleſs or hurtful, as the ſtrength is to be ſupported in ſo weakening and putrid a diſeaſe. From this rule we are to except, winter or vernal dyſenteries, as being of a more inflammatory nature.

After bleeding, the patient is to be vomited with *ipecacuanha*, which removes the ſickneſs at ſtomach ſo common in the beginning. We ſhall obſerve the emetic to be more efficacious in proportion to the evacuation of bile; and that it ſucceeds beſt when it alſo operates by ſtool. Both theſe effects were more certain, when inſtead of the uſual quantity, five grains only were given at once, and repeated twice or thrice in the ſame day, till a vomiting or purging came on; which uſually happened before or ſoon after the third doſe. Fifteen grains given in this way would generally evacuate more than thirty taken at one time *. But tho' I found

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[*] Dyſenteria qua dyſenteria venæſectionem nunquam indicat. Barbette Prax. Lib. IV. cap. v.

[†] Vid. Botall. de Curat. per Sang. Miſſ. Cap. iv.

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* PISO, who firſt deſcribed this root, and recommended it in the dyſentery, appears to have relied on its purgative quality; tho' he adds, that it had ſtill better effect when it vomited alſo. Perhaps the medicine is more cathartic while freſh, than after long keeping; and that it is better in decoction or infuſion than in ſubſtance. We may likewiſe obſerve, that he recommends the ſecond and third decoction of the ſame for weak patients, as leſs cathartic and more aſtringent. I ſhall add, one of the principal paſſages relating to the uſe of his ſpecific. *Dehinc ad radicem* Ipecacuánha *tanquam ad ſacram anchoram confugiendum, qua nullum præſtantius aut tutius, cum in hoc, tam in pleriſque aliis, cum, vel ſine ſanguine, fluxibus compeſcendis, natura excogitavit remedium. Quippe præterquàm quod tuto, & efficaciter tenaciſſimos quoſdam humores per ipſam alvum, ſæpiſſime autem per vomitum ejiciat, & a parte affecta derivet, vim quoque aſtrictivam poſt ſe relinquit. Illud vero hoc modo perficitur. Drachmæ duæ radicis* Ipecacuánha *in* ℥iv. *liquoris appropriati coctæ, vel per noctem maceratæ, cujus infuſum cum vel ſine oxymelis* ℥i. *exhibetur. Poſtridie ſemel atque iterum pro re nata, ſecunda imo tertia ejus decoctio repetenda; tam quod ægri debiliores eam facilius ferant, quam quod aſtrictoria ejus vis tunc magis efficax appareat.* GUL. PISON. Hiſt. Nat. & Med. Indiæ Occident. Lib. II. cap. ix.

this manner of giving the root very ſucceſsful, and eſpecially when repeated once or oftner after a day's intermiſſion, and that it was the leaſt expenſive courſe; yet, I laid it aſide on account of the exceſſive ſickneſs that generally accompanied the operation: tho' upon the whole I am not yet clear, whether it is not the ſureſt method of cure.

After repeated trials, I found the *vitrum ceratum antimonii* the moſt ſpecific of all the emetics, not only in relieving the ſtomach, but alſo the bowels, if given in the beginning. But as the virtues of this medicine, with its doſe and manner of operating, have been fully ſet forth elſewhere *, I ſhall omit them here; and only obſerve, that notwithſtanding I was convinced of its being a powerful remedy, yet the operation being always rough, I could not avoid being anxious about the event, and wiſhed to be able to cure the patient, tho' more ſlowly, yet with a milder remedy. Wherefore I confined its uſe to the more obſtinate caſes, and have obſerved it to ſucceed when other things have failed, if the bowels were tolerably ſound, the patient little feveriſh, and not too low. Another inconvenience attends this medicine, common to all antimonials; which is the difficulty of making it to a ſtandard. Hence it happens, that a moderate doſe at one time, will be too little or exceſſive at another. The improvement lately made upon it at Paris, by M. Geoffroy, may perhaps remove this objection *.

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* Vid. Med. Eſſays, Vol. V. Mem. de L'Acad. des Sciences A. 1745.

But, whatever fault may be found with this preparation, there can be no harm in adding a grain or two of emetic *tartar* to a ſcruple of *ipecacuanha*; whereby the virtues of the root will be retained, and the medicine rendered more purgative and efficacious in evacuating the bile. For, having made ſeveral trials of this compound, I found it preferable here, as well as in the bilious fever, to the ſimple powder.

Next day after the vomit, the patient was purged with rhubarb; to which were joined a few grains of ſalt of wormwood. Sydenham adds other gentle purgatives, to quicken the operation; which may be ne-

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† Ibid.

ceſſary if this drug is not good, or too little of it given.

At all times we muſt attend leſs to the doſe than to the effects, which are never to be judged of by the frequency but the largeneſs of the ſtools, and the relief the patient finds from the gripes and *teneſmus* after the operation. The motions are generally more frequent from the diſeaſe alone, than from the purgative. As on the one hand, the phyſician muſt avoid all the rough and ſtimulating purges, ſo, on the other, he is not to ſpare thoſe of a lenient kind, eſpecially the rhubarb, which is generally underdoſed. Of this, the ſick may have at firſt from two ſcruples to a drachm*; and according as this ſhall work the ſucceeding doſes are to be proportioned. Degnerus, one of the beſt authors on this ſubject, adviſes to give this medicine in a watery tincture in a ſmall quantity, but to repeat it every four or ſix hours, and continue it for two or three days, or till the worſt ſymptoms diſappear †. As I have never tried this method, I cannot pretend to determine which of the two is beſt in a recent flux; but, in the advanced ſtate, this ſeems preferable to the giving larger doſes at longer intervals. Which ever of the two ways is choſen, it is neceſſary the rhubarb ſhould purge well; which it rarely does in the ſmall quantities uſually given.

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* Vid. Barbette Prax. Lib. iv. cap. v.

† Hiſtor. Dyſent. Cap. III. § xxxvi. and ſeq.

In winter and vernal fluxes, I have found bleeding and rhubarb ſufficient, without the vomits: for, then the ſtomach is leſs diſordered. At all times, whether the vomit is repeated or not, the purge muſt, either the next day or the day following; and afterwards as often as is conſiſtent with the ſtrength of the patient, or as the ſtubbornneſs of the caſe requires. We are to obſerve, that the neceſſity of continuing the phyſick, is to be determined more by the obſtinacy of the gripes and *teneſmus* than by blood in the ſtools. Without ſuch frequent evacuations, it is in vain to attempt a cure; as all opiates and aſtringents only palliate, or render the diſeaſe more fatal in the end.

As to opiates, it were better they never were uſed at all, than given before the *firſt paſſages* are thoroughly cleanſed. For, tho' they afford ſome eaſe; yet, by penning up the wind and corrupted humours, they fix the cauſe. This I preſume to affirm from repeated experience; tho' Sydenham ſeems to apprehend little danger from them. Indeed when the dyſentery was moſt epidemic, he did not omit purging; but at all other times he ſeems to have truſted to *laudanum* alone[*]. But, whatever was the nature of thoſe fluxes, I am well aſſured, that theſe incident to an army are of a leſs gentle nature, and never to be cured without evacuations. The beſt rule, therefore, is to withhold *opium* till the patient is both vomited and purged; and when it becomes neceſſary, to begin with ſmall doſes. I have generally uſed the *pil. Matthæi*[†], or the following mixture:

℞ *Aq. Cinnamom. ten.* ℥vij. *Aq. Cinnamom. ſpir.* ℥i. *Elect. e Scord. cum Opio,* ʒß. *M.*

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[*] De Morb. Acut. Sect. III. cap. iii.

[†] Pharm. Edinburg.

Of this the patient took a ſpoonful or two after every motion, on the days the rhubarb was intermitted; or at bed-time, after the operation of the phyſic, he uſed about ſeven grains of the pill. If theſe failed to give reſt, it was a ſign ſome of the corrupted humours remained in the bowels, and that it was more proper to go on with the evacuation than to ſuppreſs the flux.

The warmer carminatives are ſo far from mitigating the gripes and expelling the wind, that they rather tend to increaſe them. Next to opiates, I found nothing better for allaying the pains than fomenting the belly, and drinking chamemile tea. Which laſt was firſt thought of on account of its antiſpaſmodic and bracing quality; but having found it ſince to be a powerful antiſeptic, I am inclined to think that moſt of its effects were owing to that principle. The fomentations were made of common herbs, (adding ſome ſpirits), but as they required a frequent repetition, they were leſs adapted to the ſoldiers than to the officers, who were better attended. And for the ſame reaſon, mucilaginous and anodyne clyſters were of leſs general uſe. When the pains of the belly were too fixed to yield to fomentations, they were relieved by a bliſter on the part affected; and ſometimes I have uſed only a warm plaiſter, with a fifth part of the *Emplaſtrum Epiſpaſticum* added to it. Theſe flatulent pains would ſometimes affect the ſide, as in a pleuriſy; but rhubarb, fomentations, or bliſters, were the cure, without bleeding.

Theſe are the chief rules to be obſerved in the firſt ſtage of the diſeaſe. But when either by neglect or miſmanagement the flux has continued till the ſtrength is much impaired, the inteſtines relaxed, and the villous coat abraded, the caſe becomes highly dangerous; tho' there are ſtill hopes, as long as there are neither ichorous nor involuntary ſtools, *aphthæ*, *petechiæ*, nor a hiccup; and that the patient does not complain of great lowneſs and anxiety at the breaſt: for, then the caſe is deſperate, and even ſcarcely admits of palliatives; ſince opiates have little effect either in eaſing the pain or ſtopping the looſeneſs. But when there is place for medicine, after taking away a little blood, omitting vomits or uſing them cautiouſly, rhubarb and aſtringents are to be ſo intermixed, that at the ſame time the putrid humours are diſlodged, the ſtrength may be ſupported, and the inteſtines braced. For this purpoſe, theſe medicines are to be given alternately till the gripes and *teneſmus* are removed. The proper aſtringent is the mixture preſcribed above, or the following:

℞ *Extract. Lign. Campech.* ʒiij. *Solv. in Aq. Cinnamom. ſpir.* ℥i. *add. Aq. fontan.* ℥vij. *Tinct. Japonic.* ʒij. *M.*

Of this laſt let the patient take two ſpoonfuls once in four or five hours. Sometimes one and ſometimes the other was uſed, according as an opiate was more or leſs wanted.

In ſome caſes the patient would ſeem likely to recover, but relapſe upon voiding the hard *ſcybala* formerly mentioned; which coming away in ſmall parcels, for ſeveral days together, made a conſtant irritation. Theſe, therefore, are to be ſpeedily evacuated, either by a full doſe of rhubarb with manna, or by frequent oily clyſters, which will have the ſame, or, perhaps, a better effect.

The dyſentery, after a ſeeming cure, is apt to recur upon any cold or error in diet; ſo that, conſidering how incident both are to ſoldiers, a thorough recovery is not to be expected, if the convaleſcents return that ſeaſon to the field. However, we may obſerve, that for the moſt part the relapſes are not attended with that degree of acrimony as at firſt; but then, on the other hand, that the inteſtines being weakened, they become more ſenſible of irritation. When relapſes are apprehended, or the cure is imperfect, the perſon muſt ſtill uſe a ſoft and mucilaginous diet, and continue to take ſome mild aſtringent, till his health is confirmed. This laſt intention has been anſwered by lime-water, given to a pint a day, and ſoftened with half that quantity of boiled milk. Sometimes ſmall doſes of the bark have been no leſs effectual, when joined to the extract of logwood or the *tinctura japonica*. At other times I have found the following electuary to be uſeful, when the ſtomach could bear it.

℞ *Conſerv. Roſar.* ℥i. *Balſ. Lucatell.* ʒß. *cum Syr. e Cortic. Aurant. q. ſ. f. Elect. Cap. bis terve die mol. nuc. moſch* *.

Some of the officers, upon their return to England, have had recourſe to mineral waters to perfect their recovery, but received little benefit from any but thoſe of *Shadwell*, which are very ſtyptic. Both with and without theſe, I have found the following bitters efficacious in ſtrengthening the bowels.

℞ *Cort. Peruvian. pulv.* ℥i. *Rad. Serpentar. Virg. contus.* ʒß. *infund. triduum in Vin. rub. Opport. Lib.* ij. *et Col. Cap. bis die cochl.* iij. *vel* iv. *cum Tinct. Japonic. gtt.* XL.

As to diet, I followed the common practice in confining the patient, in the beginning, to rice-gruel, panado, mutton-broth and the like; and gave for drink, rice or barley-water, or the white decoction In the convaleſcent ſtate, they were allowed meat, but no ſmall beer, and never any milk, unleſs diluted with lime-water; having obſerved, that milk by itſelf was apt to increaſe the gripes.

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* The virtue of this medicine may be chiefly owing to the wax. Vid. DIEMERBR. Obſ. et Cur. Med. obſ. xxviii.

At firſt I uſed the chalk julep, but being ſoon ſenſible of its bad effects, both in the beginning and low ſtate of the diſeaſe, I left it off; tho' I could not then ſo well account for its diſagreeing oftner with the ſick than other aſtringents: but having ſince found by experiments, that both the chalk and the *teſtacea* are of a ſeptic nature †, it ſeems reaſonable to reject them here; and the rather, that abſorbents in general have been chiefly recommended in the cure of a dyſentery, on a falſe ſuppoſition, that it aroſe from an acid ||. Hence all acids were forbid; tho', conſidering the putrid nature of the diſeaſe, nothing could be more ſtrongly indicated.

Theſe, therefore, are to be given in ſo ſmall a quantity as not be too ſharp for the bowels: a practice not only confirmed by Degnerus*, but by Dolæus, an author alſo of experience, and of ſuch candour, that tho' he refers the cauſe to an acid, yet ſtrongly recommends

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† Append. Paper III: Exp. xxiii.

|| Sylv. Prax. Append. Tract. X. ſect. 206. 772.

* Vid. Hiſt. Dyſent. Cap. III. § lxxvii. Hoffman in theſe caſes recommends the uſe of Rheniſh wine.

a mixture of lemon-juice with oil, declaring, that with that plain medicine he had cured above a hundred †. Conformable to this method of ſheathing the acid, in the German campaign, we were told by a commander of the Huſſars, that his men, when ſeized with the dyſentery, put cream and vinegar in ſeparate veſſels, and with two ſtraws endeavoured to ſuck up equal portions of each at a time.

Pure air being of the utmoſt conſequence in the cure, the phyſician can never be ſucceſsful in full hoſpitals, unleſs every ward is kept ſweet by a ventilator. The next expedient is to lay the ſick, if numerous, in churches, barns, or ruinous houſes only, where neither they nor their nurſes can confine the air. Not but that expoſitions to cold are hurtful, and that a conſtant free perſpiration is highly conducive to the cure: but when warmth is incompatible with a purity of air, we muſt chiefly regard the latter. For the ſame reaſon, it is proper that ſuch men, as are not confined to their beds, ſhould go out to eaſe themſelves, tho' with ſome hazard of catching cold; and that the privies ſhould be covered every day with freſh earth. It is alſo of the utmoſt importance, that the nurſes ſhould keep every utenſil within doors as neat and clean as poſſible.

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† Encyclopæd. Med. Lib. III. cap. v. § xx.

The third ſtate of the diſeaſe remains to be conſidered: but as this conſiſts in a combination of the flux with a malignant fever, ariſing either from a putrid *fomes* within the body, or from the foul air of the houſe, it will be proper to refer it to the following chapter.

## CHAP. VII.

### *Obſervations on the* MALIGNANT FEVER *of the* HOSPITAL.

I COME now to the moſt fatal diſtemper incident to an army, which is the hoſpital fever. In treating of which, I ſhall, 1. deſcribe its riſe, and the manner of the infection. 2. The ſymptoms. 3. The prognoſtics. 4. The diſſections of ſome who died of it. 5. The method of cure. And laſtly, from theſe materials I ſhall enquire into its nature and immediate cauſe.

## S E C T. I.

### *Of the riſe of the Hoſpital Fever, and the manner of the infection.*

THE hoſpitals of an army, when crouded with ſick, or when the diſtempers are of a putrid nature, or at any time when the air is confined, eſpecially in hot and dry weather, produce a fever of a malignant kind and very mortal *. I have obſerved the ſame ſort ariſe in foul and crouded barracks; and in tranſport ſhips, when filled beyond a due number and detained long by contrary winds; or when the men were kept at ſea under cloſe hatches in ſtormy weather §.

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* Vid. Part I. ch. ii. p. 19. Ch. iii. p. 27, 32, 33. Ch. vi. p. 49, 51, 57, 58, 63. Ch. viii. p. 75, 84. Part II. ch. ii. ſect. iii.

§ I have ſeen here (at London) two caſes of this fever at different times in perſons who were taken ill at ſea, or immediately upon landing, after a voyage from Leith, in bad weather with contrary winds, in ſhips crouded with paſſengers.

Hoſpital-ſhips for diſtant expeditions have always been deſtructive both to the ſick and their attendants.

As ſoon as I became acquainted with this fever in the hoſpitals abroad, I ſuſpected it to be the ſame with what is called here the jail-diſtemper, which I had never ſeen; and was confirmed in my opinion by having an opportunity of comparing them, furniſhed by an accident mentioned in the Firſt Part of theſe obſervations *.

This diſeaſe is then incident to every place ill-aired, kept dirty, and expoſed to putrid animal ſteams from diſeaſed bodies. And upon this account, jails and military hoſpitals are moſt obnoxious to this kind of peſtilential infection; as the firſt are in a conſtant ſtate of filth and impurity, and the laſt are ſo much filled with the poiſonous *effluvia* of ſores, mortifications, dyſenteric and other ſeptic excrements. I have known inſtances of its beginning in an hoſpital, when there was no other cauſe but one of the men having a mortified limb. Nay, it is to be apprehended, that when a ſingle perſon is taken ill of any putrid diſeaſe (ſuch as the ſmall-pox, dyſentery, or the like) and lies in a ſmall and cloſe apartment, he may fall into this malignant fever. This I have known to happen in camp, when any has been ſeized with a feveriſh diſorder and kept his tent too cloſe. But, excepting a few ſuch occurrences, this fever is properly none of the camp diſeaſes, tho' it be univerſally accounted ſuch; for, being frequently ſeen in camp hoſpitals, it is therefore ſuppoſed to come from the field.

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* Ch. vi. p. 57.

I have ſeen ſome inſtances of a high degree of contagion attending it; but the common courſe of the infection is ſlow, and catching to thoſe chiefly who are conſtantly confined to the bad air; ſuch as the ſick in hoſpitals and their nurſes, and priſoners in jails. But where there is not a great quantity of infectious matter, when it is not particularly virulent, or when a perſon has not breathed long thoſe dangerous ſteams, the ſymptoms come on ſo ſlowly, that there is time for prevention before the fever is quite formed. Much will alſo depend on the conſtitution; ſometimes one will have the diſorder hanging about him for ſeveral days before it confines him to his bed; others I have known complain for weeks of the ſame ſymptoms, without any regular fever: and others, after leaving the infectious place, without complaint, have afterwards fallen ill of it *.

## SECT. II.

### *Of the Symptoms.*

WHEN the diſtemper comes on ſlowly the firſt complaints are ſmall interchanges of heat and cold, ſometimes a ſenſe of numbneſs in the arms, loſs of appetite, and, the diſorder being greateſt at night, the body is hot, the ſleep interrupted, and not refreſhing. With theſe ſymptoms there is ſome pain or confuſion of the head, chiefly about the forehead. The pulſe is at firſt little quicker than natural; and the drought, if any, is inconſiderable. Thoſe who are thus affected find themſelves too much indiſpoſed to go about buſineſs, but too well to be altogether confined. In this ſtate, ſometimes a change of air will remove the diſorder, ſometimes a ſweat. I have had experience of both methods of preſervation in my own caſe. What may ſeem particular, I have more than once known a large bleeding, while the perſon was going about with ſuch ſymptoms, ſo far from relieving the head, immediately ſink the pulſe and bring on a *delirium.*

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* Vid. Part I. ch. vi. p. 58.

Except by this laſt mark the diſeaſe is not eaſily to be diſtinguiſhed, in the beginning, from any common fever *. The diagnoſtics muſt then be taken from other circumſtances. We are therefore to enquire if the perſon has been expoſed to the uſual cauſes of fevers, or to foul air and infection; again, whether he is relieved by bleeding or not: becauſe, in inflammatory fevers, bleeding conſtantly moderates all the ſymptoms, but in this it rarely gives eaſe.

When the fever advances faſt, the ſymptoms already mentioned are all in a higher degree; and to theſe are added, great laſſitude, *nauſea*, and pains in the back, a more conſtant pain and confuſion in the head, and a dejection of ſpirits. At this time the pulſe is never ſunk, but beats quick, and often varies in the ſame day as to ſtrength and fullneſs. The firſt bleeding, if moderate, affects the pulſe little; but if the evacuation is large, and eſpecially if repeated, to anſwer a falſe indication of inflammation, the pulſe increaſing in frequency will be apt to ſink in force, often irrecoverably, whilſt the patient becomes delirious. But withal, we muſt obſerve, that in every caſe independent of evacuations the pulſe, ſooner or later, ſinks, and gives then certain indication of the malignity of the diſtemper.

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* Febres malignas in principio ſtatim cognoſcere difficile eſt, cum malignitas ſæpe diu lateat, et non niſi ubi vires ſumſit ſeſe prodat. SENNERT. Epit. de Febrib. Lib. IV. cap. x.

The blood has been found ſo various, that it is not eaſy to predict what will be its appearance; for, tho' commonly it is little altered, it has been ſeen ſizy, not only upon the firſt attack but after the fever was well formed. The worſt kind is when the *craſſamentum* is reſolved, but this does not happen till the diſeaſe has continued for ſeveral days; and then it is a ſign of high putrefaction.

The urine rarely diſcovers great marks of fever; it is ſometimes of a reddiſh or flame colour, which it preſerves throughout; but is oftner pale, and varies from day to day in colour as well as crudity; being ſometimes clear, ſometimes clouded: but towards the end, upon a favourable *criſis*, it becomes thick, but does not always depoſite a ſediment.

If the ſick lie warm, and have had no preceding flux, the body keeps generally coſtive; but when they lie cold, as they often do in field hoſpitals, the pores of the ſkin being ſhut, a *diarrhœa* is a common ſymptom, but then is never critical. In the worſt caſes a flux appears in the laſt ſtage; but the ſtools are involuntary, colliquative, ichorous, or bloody, and of a cadaverous ſmell, the effects of a mortification of the bowels, and the ſign of approaching death. When the hoſpitals are filled with dyſenteries, ſome of the nurſes will be infected with the flux only, and others with the malignant fever, ending in bloody and gangrænous ſtools.

In the beginning the heat is moderate; but in the advanced ſtate (when the pulſe ſinks) tho', on firſt touching the ſkin, it ſeems inconſiderable, or even below natural, yet upon feeling the pulſe for ſometime together, I have been ſenſible of an uncommon ardour, leaving an unpleaſant ſenſation on my fingers for ſome minutes afterwards *. The firſt time I obſerved this, I referred it to the force of imagination; but I was aſſured of the reality by repeated experiments, and the teſtimony of others, who, without knowing of my obſervation, made the ſame remark. A day or two before death, the extremities become quite cold, and then the pulſe is hardly to be felt.

The ſkin is generally dry and parched, tho' ſometimes there are ſhorter or longer ſweats, eſpecially in the beginning. Thoſe produced by medicine are of no uſe but on the firſt attack, at which time they will often remove the fever; but ſuch as are natural are never critical till the diſtemper begins to decline. Theſe are rarely profuſe, as in other fevers, but gentle, continued and diffuſed equally over the body: and ſometimes the diſeaſe will terminate by an almoſt imperceptible

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* Galen deſcribing the autumnal remitting fevers, makes the ſame remark about the heat: *Febrium, quæ a putredine oriuntur, maximum indicium eſt mordacitas et acrimonia caloris; quæ perinde ac fumus nares et oculos, ſic ipſa erodere tactum videtur.—Non ſtatim ea qualitas, admota manu, diſcernitur, at per moram prædicta caliditatis ſpecies effertur ex penitioribus partibus.* LACUN. Epit. GALEN. de differ. Febr. Lib. I. Cap. vii.

moiſture of the ſkin. The ſweats are uſually fetid, and ſometimes even offenſive to the patient himſelf.

The tongue is moſtly dry, and without conſtant care of the nurſe, becomes hard and black, with deep chops: but this ſymptom is common to many fevers. What may be particular to this is, that ſometimes the tongue will be ſoft and moiſt to the laſt, but with a mixture of a green or yellow colour. The drought is ſometimes great, oftner moderate, but the patient is never without a degree of it until he becomes inſenſible.

Some are never delirious, but all are under a great *ſtupor* or confuſion. Few retain their ſenſes till death, many loſe them early, and from two cauſes; either from immoderate bleeding, or the premature uſe of warm and ſpirituous medicines. They rarely ſleep, and unleſs delirious, have more of a dejected than of a feveriſh look. The face is late in acquiring either a ghaſtly or very morbid appearance: yet the eyes are always muddy, and generally the *white* is of a reddiſh caſt, as if inflamed. The confuſion of the head often riſes to a *delirium*, eſpecially at night;

but unleſs with an unſeaſonable hot regimen, ſeldom turns to rage, or to thoſe high flights of imagination frequent in other fevers. When the *delirium* is at its height, the face is fluſhed, the eyes are red, the voice becomes quick, and the patient ſtruggles to get up. But when that diſorder is owing to large evacuations, or otherwiſe in the advanced ſtate of the diſeaſe, the face appears meagre, the eye-lids, in ſlumbers, are only half ſhut, and the voice, which is commonly ſlow and low, ſinks to a degree ſcarce to be heard. From the beginning there is always a great dejection of mind and failure of ſtrength.

It is more common to have a *tremor* than a *ſubſultus tendinum*, or if that ſymptom appears, it is in a leſs degree than in ſome other fevers. All along as the pulſe ſinks, the *delirium* and *tremor* increaſe; and in proportion to its riſing, the head and ſpirits are relieved. Frequently from the beginning the patient is dull of hearing, and at laſt grows almoſt deaf.

When the fever is protracted with a ſlow and low voice, the ſick have a particular craving for ſomething cordial; and nothing is ſo acceptable or ſo medicinal as wine. They long for no food, yet take willingly a little panado, if wine is added. But ſuch as are delirious, with a quick voice, wild looks, a *ſubſultus tendinum*, or violent actions, bear neither hot medicines, wine, nor the common cordials.

Vomiting, and complaints of a load and ſickneſs at the ſtomach, tho' frequent ſymptoms, are not eſſential to the diſeaſe: neither are pleuritic ſtitches, difficulty in breathing, or flying pains, ſo much to be aſcribed to it as to the conſtitution of the patient, or a preceding cold.

There are certain ſpots, which are the frequent, but not inſeparable attendants of this fever. Theſe are leſs uſual on its firſt breaking out in hoſpitals than afterwards, when the air becomes more corrupted. They are the true *petechiæ*[*], being ſometimes of a brighter or paler red, at other times of a livid colour; and are never raiſed above the ſkin*. They are ſmall, and commonly diſtinct, but ſometimes ſo confluent, that at a little diſtance the ſkin looks only ſomewhat redder than ordinary, as if the colour was uniform; but upon a nearer inſpection the interſtices are ſeen. For the moſt part, theſe ſpots are ſo little conſpicuous, that unleſs look'd for attentively, they may eſcape notice. They come thickeſt out on the breaſt and back, leſs on the legs and arms, and I do not remember of ever having ſeen any upon the face†. They ſometimes appear as early as the fourth or fifth day, and at other times as late as the fourteenth. They are never critical, nor are they to be reckoned among the mortal ſigns; but only to concur with other circumſtances to argue more danger. The nearer they approach to a purple, the more ominous they are. In a few caſes, inſtead of ſpots, I have obſerved purple ſtreaks and blotches, which perhaps are more to be dreaded. Both theſe ſpots and *vibices* will ſometimes not come out till after death *; and we had a caſe in the hoſpital, when, upon bleeding, the *petechiæ* were ſeen in the arm, below the ligature, and no where elſe on the body.

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[*] Theſe ſpots, and the fever they accompany, were as far as I know, firſt diſtinctly deſcribed by FRACASTORIUS, and called *Lenticulæ* or *Puncticula*. *Vid. de Morb. Contag. Lib.* II. *ch.* vi. vii. In his time they alſo went by the name of *Peticulæ*, but have ſince been univerſally called *Petechiæ*, both Italian words latinized.

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* For this reaſon they are not to be referred to any of the *ecthymata* of the antients, which denote puſtles or erruptions higher than the ſkin, as in miliary fevers, with which this is not to be confounded.

† The faintneſs of the colour, with their not appearing on the face, ſeems to be the reaſon that they have been overlooked altogether, or but ſlightly mentioned by the antients.

This fever, tho' of the continued kind, has often exacerbations at night, with remiſſions and partial ſweats next day: and after a long continuance, is apt to change into a hectic, a remitting or intermitting form.

The length of the fever is uncertain, the time, as in the plague, depending upon the malignity: for, in proportion to its virulence the courſe is quicker. In the hoſpitals we have had it generally running from fourteen to twenty days: but ſome have died or recovered after four weeks illneſs. From the time of the ſinking of the pulſe till death or a favourable *criſis*, there is perhaps leſs change to be ſeen from day to day in this than in any other fever not of the malignant kind. When the courſe is long †, it often terminates in ſuppurations of the parotid * or axillary glands; and when theſe do not appear, it is probable the diſtemper is kept up by the formation of ſome internal abſceſs. Many, upon coming out of the fever, complain of a pain in their limbs and want of reſt; and almoſt all of great weakneſs, confuſion in their head, *vertigo* and noiſe in their ears. When the air is at the higheſt pitch of malignity, the courſe of the diſeaſe comes to be very rapid, ſo as to terminate in five or ſix days either in death or a favourable *criſis*.

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* A circumſtance incident to the plague. Vid. DIEMERBROEK de Peſte, Lib. iv. hiſt. v.

Having now deſcribed the moſt diſtinguiſhing marks of this fever, I ſhall only add, that there are certain low degrees of it that are hardly to be characterized; and which can only be diſcovered in full hoſpitals, by obſerving men languiſh, tho' the nature of the illneſs, for which they came in ſhould ſeem to admit of a ſpeedier cure. In ſuch caſes, the only marks are little head-achs, a whitiſh tongue, want of appetite, and other inconſiderable feveriſh ſymptoms.

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† That is, beyond 17 days.

* I remember one inſtance of both parotids ſwelling without any previous indiſpoſition; when the perſon, not ſuſpecting the cauſe, and applying diſcutient cataplaſms, was immediately, upon the tumours ſubſiding, ſeized with the malignant fever. This happened to Mr. Forbes, ſurgeon in town, then a mate in the hoſpital.

## SECT. III.

### *Of the Prognoſtics.*

MEN who have been weakened by other diſtempers, or by cures, as thoſe who have undergone a ſalivation, are more ſuſceptible of the infection, than the ſtrong and vigorous, and run more riſk. Thoſe who are taken into crouded hoſpitals with the ſmall pox, however good the kind may be, and however well they may get through the two firſt ſtages of that diſeaſe, fall readily into this fever and die. One who has recovered is as ſubject to a relapſe, as he was to the diſtemper at firſt. But it has not been obſerved, if thoſe who have had abſceſſes are as liable to relapſes as others. The ſecond fever is attended with double danger, as the patient has been ſo much weakened by the firſt. Women ſeem more ſuſceptible of the infection than men; but, when taken ill, eſcape better: which is probably owing to the laxity of their ſkin more favourable to a ſweat. A ſure ſign of the corruption of the air in the hoſpital, is when many of the nurſes fall ſick.

From no ſign by itſelf are we to draw any prognoſtic, and all taken together, are more fallible in malignant fevers than in others. Generally the following are good; to have little *delirium*; the ſtrength little impaired; turbid urine in the decline of the diſeaſe, and at that time a gentle ſweat or moiſture diffuſed over the body; or even the ſkin ſoft and the tongue moiſt; or to have then bilious ſtools ſucceeded by a *diaphoreſis*; the pulſe to riſe by wine or cordials, with an abatement of the *ſtupor*, *tremor* and other nervous ſymptoms. It ſeems peculiar to malignant fevers, that deafneſs is rather a good ſign. A ſediment in the urine, without other changes to the better, is no ſure mark of recovery; and ſome recover without it.

The bad ſigns are a *ſubſultus tendinum*, eyes much inflamed and ſtaring, the ſpeech quick, and the ſound of the voice altered; high *delirium*; conſtant watchfulneſs; vomitings; frequent ſtools with a ſinking pulſe and the diſorder of the ſenſes encreaſed; involuntary *fæces*; coldneſs of the extremities; and a tremulous motion of the hands and tongue. It is obſerved to be among the worſt ſigns, when the patient complains of blindneſs; when he ſwallows with difficulty; or cannot put out his tongue when deſired to do it; when he cannot lie but upon his back, and pulls up his knees; or when inſenſible he endeavours to uncover his breaſt; or makes frequent attempts to get out of bed. If to any of theſe are added ichorous, cadaverous and involuntary ſtools, it is an indication of a mortification of the bowels and approaching death.

It will not ſeem ſtrange to find moſt of theſe prognoſtics common to the advanced ſtate of other fevers, when we conſider, that from whatever cauſe a fever begins, a long continuance of it corrupts the humours, and affects the brain and nerves, much in the ſame manner as do thoſe which ariſe from infection.

## SECT. IV.

### *Of the Diſſections.*

HITHERTO we have examined the ſtate of the living body, we ſhall next conſider its appearance after death, and ſee how far by diſſections, we may advance in the knowledge of its nature and cure. And how little ſoever ſucceſsful we may have been in this reſearch, it will ſtill be ſatisfactory to think, that it has not been wholly neglected *.

The diſſections of thoſe who died of the common hoſpital fever, or of Houghton's regiment, which had the diſtemper from the jails, have been in all ten. In ſome of the bodies, all the cavities were opened; in others, either the brain alone was ſeen or the bowels. Theſe imperfections of this part of our enquiry, I thought proper to mention, that if any thing farther was to be learned from diſſection,

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* I found it the more neceſſary to make theſe diſſections, as I had met with no author that gave ſufficient light into this matter. For, tho' BONETUS has diligently collected many caſes of thoſe ſaid to have died of malignant fevers, yet they were not to be relied upon; for as much as the malignity was diſputable in ſome of them, and that in others the head was not opened.

ſection, what was here done might not be conſidered as complete, or prevent others from purſuing the point farther.

The moſt unexpected appearances after death, were abſceſſes of the brain, which I ſhall therefore more particularly mention. The firſt I ſaw of this kind, was at Ghent; but the man being brought into the hoſpital from the barracks only two days before he died, from the ſymptoms and account I had of his diſeaſe, I only could conjecture, that his death was either owing to this fever, or to one of a low or nervous kind, after lingering near a month in it. I found about three ounces of purulent matter in the ventricles of the brain, and obſerved that the whole cortical and medullary ſubſtance was extremely flaccid and tender. What was more extraordinary, I diſcovered ſome of the ſame kind of matter in the ſubſtance of the *cerebellum*, upon the upper part: yet, this perſon, with ſome *ſtupor* and deafneſs, had his ſenſes till the night before he died, ſo entire, that he anſwered diſtinctly when ſpoke to: but about that time the muſcles of his face began to be convulſed.

Of two other inſtances of men, who undoubtedly died of this fever, in one the brain was ſuppurated; in the other, the *cerebellum.* In the firſt of theſe the patient was under a *ſtupor* with deafneſs from the beginning, but was never delirious or altogether inſenſible. His pulſe ſunk very early. About ten days before he died, his head began to ſwell, and continued very large till within two days of his death, when it ſubſided a little. For ſeveral days before he died, he would taſte nothing but cold water. During his illneſs he lay on his right ſide. The head being opened, an abſceſs as big as an egg was found in the ſubſtance of the forepart of the right hemiſphere of the brain, full of a thin matter like whey. At that time, five more, ill of the ſame fever, had the like ſwelling of their heads, but recovered *. This extraordinary ſymptom I never obſerved before nor ſince. In the other caſe, the abſceſs in the *cerebellum* was about the ſize of a ſmall pidgeon's egg, containing alſo a thin ichorous matter. Nor had this patient been ever ſo thoroughly inſenſible, as not to anſwer reaſonably when ſpoken to. Two days before death, his urine turned very pale. Both theſe bodies were opened by Mr. Breach, apothecary in Southwark, then mate in the hoſpital.

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* This happened at Inverneſs, and all or moſt of them were men of Houghton's regiment. Vid. p. 57.

But, ſuppurations in the brain were not conſtant; for, another who died about this time, and had been ill about the ſame number of days, with the like ſymptoms, the pale water excepted, had no abſceſs, either in the brain or *cerebellum*. And two were opened afterwards, in whom the cortical ſubſtance of the brain had an inflammatory appearance, but no ſuppuration. In one of them the underſide of the liver was beginning to mortify, the large guts were already corrupted, and the ſmaller much inflamed. This man went off with a looſeneſs, and juſt before his death had a diſcharge of an ichorous matter from his noſe. In the military hoſpital at Ipſwich, one dying of this fever unexpectedly, after having been once in a fair way, had no ſuppuration in his brain. And about the ſame time, Dr. Clephane acquainted me, he had ſeen the head of one opened who died after an abſceſs formed in both the orbits; that he found the brain very flaccid, and about two ounces of a thin *ſerum* in the ventricles: but neither of theſe two bodies were farther inſpected.

I ſhall not enter into a deſcription of other particulars in theſe diſſections; for, tho' I have them written at length, it may be ſufficient here, from what has been ſaid, to draw the following concluſions.

That, as there is the greateſt tendency to putrefaction through the whole courſe of the diſeaſe, ſo it always either terminates in an actual mortification of ſome part, or in an abſceſs of the brain, often ichorous. That the inteſtines more particularly are ſubject to mortify, few dying without cadaverous and involuntary ſtools. And, by an obſervation we have made of the *petechiæ* appearing for the firſt time after death, it ſeems reaſonable to conclude, that theſe are always owing to a reſolution and corruption of the blood. The putrid ſweats and ſmell of the body before death are a farther argument for what has been advanced. That, as to the abſceſſes, ſo often found in the brain, the ichorous kind may be conſidered as a ſpecies of mortification proper to parts of that texture. And from the preceding caſes it ſeems probable, that theſe impoſthumations are not rare occurrences in this fever *.

From the inflammatory appearance of the brain, without ſuppuration, we may account for the ſame remedies having ſometimes in this fever quite oppoſite effects. For, tho' in the advanced ſtate, warm and ſpirituous medicines are often the beſt, yet there are ſome who cannot take them without increaſing the *delirium*; ſuch, therefore, probably have ſome inflammation of the brain, as in a common fever.

The laſt obſervation I ſhall make upon the occaſion of diſſection, is, that the great tendency of this fever to putrefaction, reduces it to the peſtilential claſs; which are all remarkable for a proſtration of ſtrength, ſunk pulſe, dejection of ſpirits, putrid ſweats and ſtools, *petechiæ*, livid blotches, and the like ſymptoms.

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* From the numerous diſſections of thoſe who died of the laſt plague at Marſeilles, it appeared, that always ſome of the *viſcera* were inflamed and mortified, and that the brain and lungs were moſt frequently affected in this manner. *Vid. Traité de la Peſte, Part.* I.

Theſe are all the inferences we may ſafely draw from the diſſection of the bodies. But from ſuch materials to aſcertain the firſt morbific matter, where the effects only are ſeen; or from thence to account for all the varieties of this fever, would be too great an attempt. Nor would it be juſt to propoſe our method of cure, as deduced from the inſpection of dead bodies, ſince the moſt ſucceſsful part of it has been taken from the experience of others, or trials of my own, preceding moſt of theſe diſſections.

## SECT. V.

### *Of the Cure.*

IN the cure of this fever, as in all others, we muſt vary our method according to its ſtate. I ſhall, therefore, diſtinguiſh it into three periods, and in each, propoſe thoſe remedies I have found by experience to be the beſt. Let us ſuppoſe the firſt to continue as long as the perſon is able to go about; the ſecond to begin with his confinement, when the fever is apparent, the head much affected, but the pulſe ſtill full; and the third, when the pulſe ſinks, and a *ſtupor* comes on, with other ſymptoms already deſcribed.

I. IN the firſt period, as well as in all the reſt, the fundamental part of the cure is to remove the patient out of the foul air. When that cannot be done, the room or ward is to be purified by making a ſucceſſion of air by means of fires, or letting it in by doors and windows, diffuſing the ſteams of vinegar, or the like: for, whatever medicines are given, whilſt the air continues in this corrupted ſtate, or indeed increaſes in it by the *effluvia* of the diſeaſed, there can be little hopes of a cure. Wherefore, in every ſtage, tho' the patient can breathe no other infectious air, but of his own atmoſphere, it will be neceſſary to keep the curtains undrawn, and uſe all other means to procure a free ventilation. In the ſtrict obſervation of this rule the cure will in a great meaſure depend. For the next article of prevention, I have ſometimes given a vomit, and after the operation, a moderate *bolus* of *theriaca*, with ten grains of *Sal Cornu Cer-*

*vi*, and ſome draughts of vinegar whey; and repeated the ſame without the vomit the next night. At other times I have uſed the ſudorifics alone, and by both methods I have generally ſeen thoſe complaints removed, which I apprehended were the forerunners of this fever received by contagion. But previous to the vomits or ſweats, if the perſon is plethoric, it will be neceſſary to take away ſome blood. I muſt not omit what may appear a minute circumſtance, that as, not only now, but afterwards, the cure depends ſo much upon a free *diaphoreſis*, it will be found conducive to that end, eſpecially with the leſs cleanly ſort, to have their feet and hands waſhed with warm vinegar and water. After ſweating, if the patient is to remain in the foul air, it will be proper to uſe, as a preſervative, the *alexipharmac* medicine I ſhall treat of afterwards.

II. BUT, in the ſecond ſtage, when the fever is manifeſt, with a quick and full pulſe, it will be proper to begin with a ſmall or moderate bleeding. When the ſymptoms are high, a plentiful evacuation ſeems requiſite;

yet large bleedings have generally proved fatal, by ſinking the pulſe and bringing on a *delirium*. Nor is a moderate bleeding to be repeated, but with the utmoſt caution; for, as many things here are contradictory to the common rules, ſo experience ſhews, that even thoſe whoſe blood is ſizy, unleſs the lungs are inflamed, are generally the worſe for a ſecond bleeding. If only the head ſuffers, it will be ſafer to bleed by leeches at the temples, than to open a vein in the arm. But, in the *delirium* with a ſunk pulſe, even leeches do no good, ſometimes harm; and phlebotomy is pernicious. Many have recovered without bleeding, but few who have loſt much blood *.

Vomits are alſo to be uſed cautiouſly. Before the diſeaſe is formed, one is recommended ed for prevention; and even if the ſtomach has been foul, as is moſt uſual in autumn, a gentle emetic is alſo proper in the beginning of the ſecond period, as it may relieve the ſtomach, and diſpoſe more to a ſweat. But when the fever is fixed, and a vomiting ſupervenes, which is always a bad ſymptom, an emetic will then be dangerous. At moſt, ſome draughts of chamomile tea, or the like, may be given, and afterwards the ſaline mixture *, and if neceſſary, a gentle opiate to quiet the ſpaſms, or a laxative clyſter to determine the humours downwards.

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* Altho' it is probable, that all malignant fevers ariſe from ſome putrid *miaſma* received from without, or generated within the body, yet I am far from thinking, that they are all to be treated in this manner. For, the remitting fever of the camp, and the ardent fever of the marſhes, often demanded repeated bleeding; and yet both proceeded from a ſeptic cauſe. Of the ſame kind was that malignant fever deſcribed by DIEMERBROEK, which beginning in the camp, infected the inhabitants of Nimeguen, and was not to be cured without large and frequent bleedings. *Vid. Obſervat. & Curat. Med. Obſ.* xxiv.

The next care is to promote a *diaphoreſis*; but in this ſtate of the diſtemper it is only to be attempted by the milder ſudorifics: and for this purpoſe the *ſpiritus Mindereri* ſeems to be the beſt. But at this time of the diſeaſe it generally happens, that the morbific cauſe is too much fixed to be expelled by ſweating; and, therefore, unleſs it comes eaſily and with relief to the patient, it is never to be forced or inſiſted on; and even if voluntary and profuſe, with a low and quick pulſe, it muſt be checked. Then the fever begins to elude all the force of bliſters, alexipharmacs and ſudorifics, until the uſual time of its decline. Of this I have ſeen many inſtances, but ſhall mention one only. Mr. Anneſly, one of the mates, was ſeized with the hoſpital fever, and after being confined to his bed for four or five days, and bliſtered, he took ſeveral doſes of muſk, each containing twenty-five grains, which opened the body, raiſed the pulſe, and brought on a thorough ſweat; yet the fever continued till about the ſeventeenth day, when it went off with a moiſture of the ſkin and turbid urine.

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* Huic ſymptomati (ſcil. vomitui) graviſſimo ſtatim medetur, quaſi miraculo, Sal Abſinthii ad ʒi. in ſucci limonum recentis cochleari exhibitum, ut experientia didici. River. in cap. de Feb. Peſtilent,

As ſoon, therefore, as it appears that the diſtemper is confirmed, it will be proper to give ſuch medicines only as were recommended before in the cure of inflammatory fevers [||]; *viz.* the *contrayerva* powders, with nitre and camphire, and the common ptiſan acidulated [*].

Tho'

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[||] Part III. ch. i. p. 160.

[*] Almoſt all authors agree in recommending acids in the cure of malignant fevers: and I have alſo followed that practice; that is, the ptiſan was ſlightly acidulated with the ſpirit of vitriol, and ſome were allowed to eat a ſlice of an orange, which

Tho' coſtiveneſs is to be prevented by emollient clyſters, (leſt an accumulation of the *fæces* prove a new *fomes* of corruption) yet this evacuation is not to be repeated ſo often as in inflammatory fevers, on account of the weakneſs.

About this time I have uſed bliſters, but without ſucceſs. Nay, upon the firſt attack, the

which moiſtened the tongue and proved grateful and refreſhing. From the notion that the *virus* was to be deſtroyed by acids, I have given freely of lemon-juice; but found it diſagree with the ſtomach, and therefore not to anſwer the intention. It is to be obſerved, beſides, that vegetable unfermented acids tend to relax the fibres and weaken; and are therefore to be uſed with the more caution in low fevers. Thus, fruit and greens diſpoſe to agues or occaſion their relapſes. The acids by fermentation, and thoſe drawn from minerals, may have different qualities; but I muſt own, that the firſt, *viz.* vinegar, was not ſufficiently tried in the advanced ſtate of the fever: and the latter, as was ſaid, was only uſed to give a little ſharpneſs to the barley-water. For, in the low and moſt putrid ſtate of this fever, I truſted chiefly to wine; in the daily allowance of which, I preſumed there might be contained as much of an antiſeptic quality as in any quantity I could give of vinegar, in the ſame time, without offending the ſtomach. This ſeems to be the proper diſtinction between the virtues of the two; the wine is moſt to be relied on, whenever it can be given without encreaſing the *delirium*; otherwiſe, vinegar or mineral acids are to be uſed. But, with regard to antiſeptics in general, it may be remarked, that tho' they are neceſſary for preventing the high degree of putrefaction, yet after the fever is once formed, we are not to expect to ſhorten it by any medicine of that kind; as ſuch have no power to remove thoſe obſtructions which are found ſo ſoon to take place in this diſeaſe. Dr. WARREN is the only author, that I remember, who cautions againſt the too free uſe of acids in a malignant fever. See his treatiſe upon that of Barbadoes, p. 44.

the whole head has been bliſtered, and the oozing kept up for ſome days; but without relieving it, or preventing any of the uſual ſymptoms.

Opiates are dangerous in this ſtate, and unſafe in the following; for, no good is to be expected from a ſweat, and if they fail in bringing that out, they are apt to increaſe the *delirium*.

III. WE come now to the third and longeſt period, in which the pulſe ſinks, the *ſtupor* is greater, a *delirium* impends, and *petechiæ* often appear. This change begins in three or or four days after the fever is formed, ſooner or later, according to the treatment or other circumſtances. What is obſervable, if the patient, on the firſt complaints, has been once or twice largely blooded, the diſeaſe will be apt to paſs over the ſecond ſtage; ſo that from a condition little removed from health, his pulſe will ſink, and at once he may become delirious. Now, whether by miſconduct, or the courſe of the diſtemper this alteration comes, we muſt alter the method, and have for our principal intention to ſupport the *vis vitæ*, (eſpecially towards the decline of the fever) but which cannot be done without warmer medicines than what have yet been propoſed. For this purpoſe, whenever the pulſe begins to flag, and the urine to turn pale, we are to leave out the nitre, and, in place of it, to add about half the quantity of Snake-root; as in this *formula.*

℞ *Aq. fontan.* ℥iv. *Aq. Alexeter. ſp.* ℥i. *Acet. deſtillat.* ℥ß. *Julep. e Camphor.* ℥ij. *Pulv. Contrayerv. comp.* ʒi. *Rad. Serpentar. Virgin. pulv.* ℈i. *Syr. e Cort. Aurant.* ʒvi. *M. Cap. ſexta quaque hora cochl.* iv.

Sometimes I have given a plain decoction of the *ſerpentaria*, adding a ſmall quantity of a ſtrong water; at other times, I have preſcribed the ſame medicine in ſubſtance, to about four ſcruples a day, with ſenſible good effects; but in the laſt campaign, an accident gave the hint of an uſeful addition. A man ill of this fever, with petechial ſpots, had a bliſter applied to his back, and the part mortified. The caſe ſeemed deſperate, but a ſtrong decoction with the tincture of the Bark being given, and continued for ſome days, with the uſual remedies, the ſore began to ſuppurate, and the caſe to take ſo favourable a turn, that there was little doubt of the patient's recovery; till nauſeating the medicine, he left it off, whereupon the gangrene recurred, and he died. From hence, however, I was induced to join the Bark to the decoction of Snake-root, and give it conſtantly in the ſunk ſtate of this fever. The firſt nine recovered who had this compound medicine, tho' four of them had the *petechiæ*, the reſt a leſſer degree of the diſtemper. And in thirty-nine caſes, that were under my care that ſeaſon, I loſt only four. But it will be juſt to add, that the places in which the ſick lay, were uncommonly well aired; and that the fever was not attended with ſo much malignity as I have ſeen it at other times. For, at Ipſwich, where the kind was worſe, and where the air was ſo much vitiated in the hoſpital, that almoſt all the nurſes were infected, as well as the men who were admitted for other diſtempers, I reckon (for I kept no exact account) that I might loſe about double that proportion.

When I firſt joined the Bark to the *ſerpentaria* in ordinary caſes, I began with a much ſmaller quantity than what was uſed in that of the gangrene, intending to increaſe it by degrees; but finding what was then given anſwer ſo well, I never altered it. This is the receipt:

> ℞ *Rad. Serpentar. Virgin. contuſ. Cort. Peruvian. pulv.* āā. ʒiij. *Coq. in Aq. fontan. Lib.* i. *ad dimid. Colaturæ add. Aq. Cinnamom. ſpir.* ℥iß. *Syr. Caryophyll.* ʒij. *Cap. quarta vel ſexta quaque hora chochl.* iv *.

By means of this decoction, not only the *vis vitæ* was ſupported, but a *diaphoreſis* promoted at the *criſis*. Even after the receſs of the fever, the ſame medicine being continued in a ſmaller quantity, not only ſerved as a ſtrengthener, but likewiſe as a preſervative againſt a relapſe, whilſt the patient remained ed in the hoſpital. In one caſe the fever terminated in a ſuppuration of one of the parotids, which was opened and healed during the uſe of the ſame medicine. I need only add, that tho' I gave the Snake-root as ſoon as the pulſe began to fail, I never joined the Bark to it till towards the decline of the diſeaſe, when the pulſe was low, the voice ſlow and weak, the head affected with a *ſtupor*, but with little *delirium*.

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* Dr. Huxham, in the like caſes, has uſed the ſame medicine, but in a different form. Vid. Eſſ. on Fev. ch. viii.

To this medicine it was neceſſary to ſubjoin a cordial, conſiſting of the common ingredients, but with a larger doſe than ordinary of the *Sal Cornu Cervi*, of which the patients generally had to the amount of half a drachm a day. But in caſes out of the hoſpital, and where there was no reſtriction as to the quantity of wine, I either omitted this cordial, or uſed it more ſparingly. In general, it agreed well with the low ſtate of theſe fevers; and in great ſinkings, which either came after unſeaſonable bleedings, or long want of nouriſhment, was the beſt reſource.

But, for a grateful cordial in this ſtate, there was nothing comparable to wine[*], whereof the common men had an allowance to half a pint a day, of a ſtrong kind,

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[*] It has been a great debate among authors, whether wine was to be given in malignant and peſtilential fevers or not; ſome condemning it altogether, and others recommending it as univerſally. ARETÆUS, in treating of the *ſyncope*, or low ſtate of the ardent fever (a putrid diſeaſe) makes a prudent diſtinction, ſhews when it is proper and when hurtful, and ſometimes preſcribes it in a large quantity. *Vid. Lib.* III. *cap.* III. *de Curat. Acut. Morb.*

Agreeable to this is an obſervation of RIVERIUS, (an author of great experience in theſe fevers) which, as relating to a ſubject we are now treating of, I ſhall tranſcribe at length: *Circa potum hoc etiam adnotandum, vini uſum in hac febre (ſcil. peſtilentiali) aliquando eſſe proficuum, utpote inſigne cardiacum, & malignæ qualitati maximè adverſum.——Hæc á nobis obſervata ſunt infinitis experimentis, ac præſertim in febre purpurata, quæ Monſpelii graſſata eſt anno* 1623, *poſt urbis obſidionem, quæ tantæ malignitatis particeps fuit, ut tertia ad minus ægrotantium pars de medio ſublata fuerit, et a vera peſte ſolo bubone diſtincta fuerit: cum non ſolum ecthymata & axanthemata rubra, livida & nigra ſed etiam carbunculi & parotides frequenter apparerent.—Iis enim ægrotantibus, quibus pulſus erat parum frequens, & pulſus ſanorum fere ſimilis, lingua humida & nulla ſitis vinum exhibuimus felici ſucceſſu; illius continuationem indicabat levamen inde emergens—Iis vero quibus febris erat intenſior cum ſiti, linguæ ſiccitate, ſcabritie aut nigredine vinum prorſus interdicebamus, eoſque in refrigerantium acidulorumque potuum uſu perpetuo detinebamus. Advertandum tamen eſt primis morbi diebus vinum nunquam eſſe adhibendum, ne materiæ nimium exagitentur; ſed tantum circa ſtatum, cum malignitatis ſigna ſeſe magis exerere incipiunt. Vid. cap. de Feb. Peſtilent.*

POTERIUS and THOMAS BARTHOLINE are more general in recommending wine: for the firſt, he only ſays, *In malignis febribus, atque in ipſo contagio vinum eſſe tutum agnoſcimus. De Feb. Lib.* II. *cap.* xxviii. And the latter, relating the caſe of a man (who being given over in a petechial fever, drank a large quantity of Rheniſh wine, and thereupon falling into a ſweat, recovered) concludes with theſe words: *Similia exempla* kind, made into whey, or added to the panado, which was their only food. But to others out of the hoſpital, I commonly preſcribed Rheniſh or French wine, of which

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*pla plura apud nos memoriæ occurrunt. Hiſtor. Anat. et Med. Rar. Cent.* VI. *hiſt.* vii.

To theſe might be joined other authorities, from writers of note; but I ſhall inſert only the following, from the celebrated profeſſor HOFFMAN. *In febribus malignis vino (ſcil. Rhenano vel hujuſmodi alio) nil datur excellentius: malignitas dignoſcitur ex motuum et virium defectu, nec non valde depreſſa ſanguinis ſpirituaſcentia, ex tardo circulo ejuſdem, quæ cuncta diſpoſitionem quandam cruoris ad putredinem deſignant. Igitur in iis morbis reſtaurare vires, ſpiritus erigere, circulum ſanguinis liberum reddere, tranſpirationem movere expedit; et in eo verſatur omnis alexipharmacorum virtus. Quod vinum hæc omnia præſtet, nolumus pluribus auctoritatibus, quibus practicorum libri pleni ſunt confirmare, ſed confugimus ad ſolam experientiam, qua nobis conſtat, plures ex malignis evaſiſſe ſolius vini moderato uſu. Diſſert de Vin. Rhenan. Præſtant. Cap.* vi. §. xiii.

It may be obſerved, that both RIVERIUS and HOFFMAN are cautious about giving wine, unleſs with a ſlow pulſe, if ſo we may interpret the *pulſus parum frequens* of the former, and the *tardus circulus* of the latter: but I muſt add, from my own experience, that in our malignant fever, when the pulſe ſunk, it became always very frequent, and that in proportion as it roſe with wine it turned ſlower; and that I have alſo had experience of the good effects of wine when the tongue has been both foul and dry. The ſureſt indication for wine is taken from the continuance of the diſeaſe, the *languor*, dejection of ſtrength, the ſlowneſs and faintneſs of the voice: but we can never be abſolutely certain of its effects till we try it. I have ſeen, in caſes of this kind, ſtrange inſtances of the power of inſtinct; for, when wine was to do good, the ſick ſwallowed it greedily and cryed for more; when it was to heat them or raiſe the *delirium*, they either ſhewed an indifference or averſion to it. Sometimes the phyſician can have no better meaſure for the quantity requiſite, than from the appetite of the patient.

ſeveral have conſumed a quart a day, and ſome part of that undiluted. And, indeed, ſo great is the virtue of wine in the cure of this kind of fever, that I have known many recover from its loweſt ſtate, when they refuſed the decoction on account of its taſte, taking nothing but a little panado with wine, and the volatile mixture every two hours by turns. Perhaps there is no rule of more importance than to give ſtrict charge to the attendants of the ſick, never to let the patient, when low, go beyond this time, without taking ſomething cordial or nouriſhing; having ſeen men, once in a promiſing condition, ſunk paſt recovery, by being allowed to paſs a whole night without ſome ſupport about the time of the *criſis*. Nothing can be ſuppoſed lower than the ſick are in the advanced ſtate of the diſeaſe; and therefore Hoffman rightly adviſes, in all ſuch caſes, to keep them conſtantly a-bed, and not to permit them even to ſit up in it. In the laſt ſtage of this fever, as well as in that of the ſea-ſcurvy, it would appear, that the force of the heart was too ſmall to convey the blood to the brain unleſs in a horizontal poſture *.

We have ſeen how inſeparable a *ſtupor* was from this fever, particularly in its low ſtate; and how apt this, in the evening, was to turn to a ſlight *delirium*. If this is all, as it is in the common courſe, nothing need be done. But if the *delirium* increaſes upon uſing wine, if the eyes look wild, or the voice becomes quick, there is a preſumption of a true *phrenitis*. And agreeably to this, I have obſerved, that at ſuch times, all internal heating medicines aggravated the ſymptoms, whilſt bliſters, before uſeleſs, became then of conſiderable ſervice. Wherefore, in this emergency, the epiſpaſtics are to be uſed as in inflammatory fevers, and when the pulſe is moſt ſunk, recourſe is likewiſe to be had to the ſinapiſms mentioned before †. As camphire is the beſt internal medicine, we are to give the mixture already mentioned, keeping to ſmaller quantities of the Snake-root §, but increaſing the camphire if the ſtomach will bear it. Having obſerved how a *delirium* would ariſe from two oppoſite errors; one, from large and repeated bleedings, and the other, from giving the warm and cordial medicines too early; it appears from hence how limited the principles are that regard the cure. Thus, neither a hot nor cool regimen anſwers with every patient, nor with every ſtate of the diſeaſe.

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* See the deſcription of the ſea-ſcurvy in Lord Anſon's voyage.

† Part III. ch. i. p. 159. Such kind of applications to the ſoles of the feet have been called *Cataplaſmata* CRATONIS, from the author, who, compounding them of horſe-radiſh, ſalt and vinegar, firſt introduced them in the cure of peſtilential fevers. Both theſe and bliſters are much recommended by RIVERIUS, from experience, in caſes of this nature. *Vid. cap. de Febr. Peſtilent.*

If a *diarrhœa* comes on in the decline of the fever, it is to be gradually checked, by adding a few drops of the *tinctura Thebaica*, or a little of the *theriaca*, to the full quantity of the alexipharmac decoction; or by giving a ſpoonful or two of the aſtringent mixture mentioned before †. For, tho' this looſeneſs may be conſidered as critical, yet as the ſick are generally too low to bear the evacuation, it muſt be reſtrained: and I have often obſerved, that when it has been ſtopt in this manner, the patient has ſoon fallen into a breathing ſweat which carried off the diſeaſe. In the worſt kinds of the fever, and eſpecially when it coincides with the dyſentery, the ſtools are frequently bloody; in which dangerous caſe, if any thing can be done, it muſt be attempted by the ſame medicines.

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§ In ſuch caſes I rarely exceeded a ſcruple of this medicine, given in ſubſtance in four and twenty hours; tho' I have not been ſenſible of its being of ſo hot a nature as to heighten the *delirium*.

† Part. III. ch. vi. ſect. iv. p. 282.

We ſhall next conſider the ſtate of the patient after the fever is over, or changed into another ſhape. If the diſeaſe terminates in the ſuppuration of the parotid glands, there is only this caution needful; which is, to open the abſceſs as ſoon as it can be conjectured to have formed matter; without waiting for a fluctuation, or even a ſoftneſs of the tumour, that may never happen: the *pus* being here ſo very viſcid, that after it is ripe, the part will feel as hard as if the ſuppuration had not begun *.

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* This may be the reaſon why theſe tumours have not always been found critical. For, RIVERIUS, after the ſwelling of the glands, was obliged to make other evacuations: perhaps from not making timely inciſions. *Vid. Cap. de Feb. Peſtilent.*

Almoſt all, when the fever is over, complain of want of reſt, frequently of a *vertigo*, a confuſion of the head, with a continuation of the deafneſs, and other nervous ſymptoms, ſometimes the conſequence of great lowneſs, and at other times of ſome diſorder not ſo eaſily to be accounted for. The remedies are the *pilulæ Matthæi* at night, with analeptics and medicines of the ſtrengthening kind. When the pulſe is ſlow, a few grains of *aſa fœtida* given twice a day, have a good effect: but if there is any appearance of a hectic fever from an inward abſceſs, the caſe is to be treated accordingly. Upon comparing ſome of the remaining ſymptoms of thoſe that recovered, with the condition of the brain in ſuch as died, I have been induced to think, that ſome part of this ſubſtance might ſuppurate, and yet the patient grow well.

Sometimes the perſon falls into an irregular intermittent, which (if not hectic from an internal abſceſs) may proceed from an omiſſion of evacuations of the *primæ viæ*. For, it is eaſily conceived, that after a long fever of a putrid nature, attended with a *languor* of the bowels, the *fæces* may be accumulated,

mulated, ſo as to occaſion various diſorders. But in ſuch caſes, after proper evacuation, the Bark is almoſt a ſure remedy.

## SECT. VI.

### *Of the Nature and immediate Cauſe of malignant Fevers.*

IT is evident from the preceding account, that this diſtemper is of a truely malignant or peſtilential nature, as appears by the manner in which the head is affected, the dejection of ſpirits, debility, ſunk pulſe, the ſuppuration of the parotid and axillary glands, the putrid ſweats, petechial ſpots, mortifications and contagion. For, tho' all theſe ſymptoms are not found together in one perſon, yet they are common to the diſeaſe; and it is well known, that in the plague itſelf the ſymptoms are various, according to the degree of virulence and the conſtitution of the perſon infected.

It will be unneceſſary to ſhew the difference between a malignant or peſtilential fever and the true plague, as that diſtinction, not clearly apprehended by the antients, has been well aſcertained by ſome of the beſt later writers on that ſubject *. And therefore I ſhall only remark, that tho' the hoſpital fever may differ *in ſpecie* from the true plague, yet it may be accounted of the ſame *genus*, as proceeding from a ſimilar cauſe, and attended with the like ſymptoms.

I. The malignant or peſtilential fevers are various, according to the virulence of the *miaſma* or putrid ferment received into the blood; but all depend upon ſome internal or external *fomes* of corruption, whether brought on by a ſcorbutic habit, or by the exhalations from putrid animal, or vegetable ſubſtances.

The hoſpital and jail fevers are to be conſidered as the ſame diſtemper, and little, if at all, different from what have ariſen after battles, when the bodies of the ſlain have been left unburied to rot upon the field. This Galen notes as one of the cauſes of peſtilential fevers †, and is ſupported by the teſtimony of other authors; in particular by Foreſtus, who was eye-witneſs to a diſtemper of this kind, (which indeed he calls a plague) ariſing from the ſame cauſe, attended with buboes and a high degree of contagion *. The ſame author alſo gives an account of a malignant fever breaking out at Egmont, in North Holland, occaſioned by the rotting of a whale that had been left upon the ſhore †. We have a like obſervation of a fever affecting a ſhip's crew, upon the putrefaction of ſome cattle they had killed in the iſland Nevis, in the Weſt Indies ||. Thoſe men were ſeized with a pain in the head and loins, great weakneſs and diſorder of the ſtomach, accompanied with a fever; ſome had carbuncles, and it was remarked, that purple ſpots appeared after death.

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* Fracastorius, Mindererus, Sennertus, Barbette, Diemerbroek, Riverius, Mead.

† Epit. Galen. de Feb. Differ. Lib. I. cap. iv.

Hippocrates deſcribes a peſtilential conſtitution, and imputes it to a ſouthern, humid and cloſe ſtate of the air §. The putrid *effluvia* of lakes and marſhes are mentioned by Galen as having the ſame effect ‡.

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* Obſervat. Lib. VI. obſ. xxvi.

† Obſ. ix. ſchol. PARAEUS ſays, that in his time the like happened on the coaſt of Tuſcany. *Vid. Cap.* III. *de Peſte.*

|| Traitè de la Peſte.

§ Epidem. Lib. III. ſect. iii. referred to, before, p. 231.

‡ Epit. GALEN. de Feb. Differ. Lib. I. cap. iv.

One of the moſt memorable peſtilential fevers incident to an army, is recorded by Diodorus *; which broke out among the Carthaginians in Sicily, at the ſiege of Syracuſe, and proved very deſtructive. The author not only mentious ſome of the moſt diſtinguiſhing ſymptoms, but reaſons well about the cauſe. We find that pains in the back and eruptions † were common; that ſome had bloody ſtools, and others were ſeized with ſuch a *delirium*, as to run about and beat all that came in their way ‖; that they died on the fifth, or ſixth day at fartheſt; that the phyſicians knew no cure; and that it was the more fatal from the ſick being abandoned by every body, on account of the contagion. As to the cauſe, the hiſtorian takes notice of the multitude of people confined within a narrow compaſs; the ſituation of the camp in a low and wet ground; the cold air from the marſhes before ſun-riſing, ſucceeded by ſcorching heats in the middle of the day §. He adds, the putrid ſteams ariſing firſt from the marſhes, and afterwards from the bodies of thoſe who lay unburied.

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* Bibliothec. Hiſt. Lib. XIV. cap. lxx. lxxi.

† In the original Φλύκταιναι.

‖ This circumſtance of a ſudden *delirium* agrees with what was mentioned in the deſcription of the marſh-fever in the cantonements near Bois-le-duc. Vid. Part III. ch. iv. ſect. ii.

We obſerved that the firſt full account of malignant epidemic fevers, attended with *petechiæ*, was in Fracaſtorius. The firſt appeared in the year 1505, and another three and twenty years after; both in Italy. This author omits the cauſe of the former; but the latter he aſcribes to an extraordinary inundation of the Po, which happening in the ſpring, left marſhes, that, corrupting, infected the air throughout the ſummer.

Foreſtus remarks, that from the putrefaction of the water only, the city of Delft, where he practiſed, was ſcarce ten years together free from the plague, or ſome peſtilential epidemic *. In the year 1694 a fever broke out at Rochefort, in France, which, on account of the malignant ſymptoms and great mortality, was at firſt believed to be the plague †. But M. Chirac, who was ſent by the court to enquire into the nature of it, found the cauſe to ariſe from the ſalt marſhes, made by an inundation of the ſea; and obſerved, that the corrupted ſteams, which ſmelled like gun-powder, were carried to the town by the wind that blew long from that quarter. About two thirds of thoſe that were taken ill died §. The fever raged in June, July and Auguſt, and then ended upon a great fall of rain, which purified the air and refreſhed the water.

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§ This is ſaid to be the principal cauſe of the malignant camp diſeaſes in Hungary

* *Obſervat. Lib.* VI. He adds, that the magiſtrates, upon his repreſentation of the cauſe, erected a wind-mill for moving and refreſhing the water. At that time, Holland was much more liable to inundations and the ſtagnation of water than it is at preſent.

I might adduce many inſtances of malignant fevers, occaſioned by the putrid *effluvia* of marſhes, from other authors; but as thoſe already mentioned are ſufficient to prove what has been advanced, I ſhall obſerve upon the whole, that the bilious or remitting and in-

† Traité des Fievres malignes: Vid. œuvres poſthumes de M. Chirac.—Eloge de M. Chirac, par M. de Fontenelle.

§ In thoſe who were opened, the brain was either found inflamed, or loaded with blood. The fibres of the body were remarkably tender, and the bowels were either ſuppurated or mortified.

termitting fevers of low and wet countries may be conſidered as *ſpecies* of the malignant or peſtilential fever; ſince a high degree of theſe have been ſeen with all the virulent ſymptoms peculiar to this claſs of diſeaſes *. In general it may be remarked, that the putrefaction of animal or vegetable ſubſtances in a dry air is moſt apt to produce a malignant fever of a continued form; whereas putrid *effluvia* in a moiſt atmoſphere have a greater tendency to bring on paroxyſms and remiſſions. But the ſteams of corrupted blood diſpoſe more to a flux than to any other diſtemper; for, tho' ſome will be ſeized with the hoſpital fever by the contagion of bloody ſtools, yet I have obſerved, that for the moſt part the infection ended in the dyſentery †.

From this view of the cauſes of malignant fevers and fluxes, it is eaſy to conceive how incident they muſt be, not only to all marſhy countries after hot ſeaſons, but to all populous cities, low and ill aired; unprovided with common ſhores; or where the ſtreets are narrow and foul; or the houſes dirty;

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* Vid. Part III. ch. iv. ſect. ii. iii.

† Vid. Part III. ch. vi. ſect. iii.

where water is ſcarce; where jails or hoſpitals are crouded, and not ventilated and kept clean; when in ſickly times the burials are within the town *, and the bodies not laid deep; when ſlaughter-houſes are alſo within the walls; or when dead animals and offals are left to rot in the kennels or dunghills; when drains are not provided to carry off any large body of ſtagnating or corrupted water in the neighbourhood; when fleſh-meats make the greateſt part of the diet, without a proper mixture of bread, greens, wine or other fermented liquors; from the uſe of old and mouldy grain, or what has been damaged by a wet ſeaſon; or when the fibres are relaxed by immoderate bathing I ſay, in proportion to the number of theſe or the like cauſes concurring, a city will be more or leſs ſubject to peſtilential diſeaſes, or to receive the leaven of a true plague, brought into it by any merchandize. I ſhall add a few inſtances in confirmation of theſe obſervations.

Conſtantinople is not only liable to frequent returns of the true plague, but to an annual peſtilential fever, which may be conſidered as

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* SCRETA de Feb. Caſtrens.

the endemic diſtemper of that place[*]. But that this is not owing to the climate, appears from its healthful ſtate during the Greek empire; and from obſerving, that even now, ſuch as live in the ſuburbs and keep out of the way of infection, are ſecure. Nor is the cauſe to be referred only to the crouds, and to the narrowneſs and naſtineſs of the ſtreets, ſince ſome of the foreigners are leſs ſubject to the ſickneſs than the Turks themſelves [†]. It muſt therefore be aſcribed to ſomething peculiar to that people; or rather to ſuch as profeſs their religion. For beſides, that peſtilential diſtempers are frequent in all the cities of the Levant, they prevail greatly in Egypt[§], where the inundations are not ſolely to be blamed, becauſe that country was more healthful before it became a province of the Ottoman Empire. And in Sennar, where Mahometiſm is eſtabliſhed, peſtilential fevers make great ravages; but ſeldomer viſit the Abyſſinians, who border on that kingdom, and live in a hotter climate, but are Chriſtians [*]. Now for this difference the following cauſes may be aſſigned. The religion of the Turks enjoins conſtant ablutions; and it is well known how much warm bathing, by relaxing the fibres, diſpoſes the body to putrid diſeaſes [†]. In other points, the Turks are not reputed cleanly. Add to this, their abſtinence from wine and all fermented liquors, (the great antidotes to putrefaction) [‖]; the

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[*] See TIMONI's account of the plague at Conſtantinople in Phil. Tranſ. abridged, Vol. VI. part iii. ch ii. ſect. xxi.

[†] Tho' TIMONI obſerves, that ſtrangers in general run a greater hazard than the citizens, yet he adds: *Armenii omnium nationum minime ad peſtem ſunt diſpoſiti: obſervo illos pauciſſimis uti carnibus: cepis, porris, alliis, vinoque maxime utuntur.*

[§] Vid. PROSPER. ALPIN. de Med. Ægypt.

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[*] Lettres Edifiantes et Curieuſes, iv. Recueil.

[†] Therefore Celsus forbids bathing in times of the plague, that is, as was ſhewn before, during the ſeaſon in which malignant or peſtilential fevers prevail. *De Med. Lib.* I. c. x.

[‖] We have the following remarkable obſervation in Forestus on occaſion of a plague or peſtilential fever that raged in his time. *Quicunque aquam ob ingentem calorem febrilem bibiſſent, ut villicus quidam, ad quem curandum alio morbo affectum, accitus eſſem, mihi narravit, correpti intra duos dies moriebantur. Qui vero cerviſiam bibebant, utpote potum magis huic noſtræ regioni conſuetum, iis morbus protrahebatur.* Dr. Rogers obſerves, that ſuch as riot on animal food, and drink water only, are ſubject to putrid and ſlow fevers. Vid. Eſſay on Epidemic Diſeaſes, p. 49. The obſervation is uncommon, but I have reaſon to believe it a juſt one. The only caſe I ever ſaw of a malignant fever, attended with petechial ſpots, where the habit was good, and where no external ſeptic cauſe could be blamed, was in a gentleman both young and robuſt, who after uſing wine and other fermented liquors freely for ſome years, left them ſuddenly off and drank water only, tho' he continued in the courſe of a full animal diet. This perſon, upon taking cold, fell into a fever, which, after the principle of fataliſm, which keeps them from avoiding infection; and their ignorance of all learned arts, by which they might know how to prevent or cure theſe diſeaſes.

In the account of the epidemic malignant fever of Cork, in Ireland, we find the cauſe aſcribed by the author *, to a concurrence of theſe circumſtances, the moiſture of the air, the impurity of the water, the infection of the ſlaughter-houſes, and the offals left to corrupt in the ſtreets, joined to the immoderate quantity of fleſh-meats eat by the poorer people, without bread or fermented liquors, during the victualling ſeaſon.

Foreſtus acquaints us of a plague (rather a peſtilential fever), that raged at Venice in his time, owing to the corruption of a ſmall kind of fiſh in that part of the Adriatic †. And the ſame author quotes Montanus, for a deſcription of the peſtilential endemic fever at

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the ordinary evacuations, put on a malignant form and proved mortal.

* See Dr. ROGERS's Eſſay on Epidemic Diſeaſes. In this book we have a full and curious account of the riſe of a malignant fever and ſmall-pox, deduced from a putrefaction of the air peculiar to the city of Cork, from Auguſt to January.

† Obſervat. Lib. VI. obſ. ix. ſchol.

Famaguſta, in the iſland Cyprus, ariſing in ſummer from the corruption of a lake in the neighbourhood. This diſtemper is taken notice of by Fracaſtorius, and allowed to be the ſame with what he calls the *lenticulæ*, ſince known by the name of the petechial fever.

Hiſtory abounds with examples of peſtilential fevers, added to the other miſeries of a ſiege: nay, there is ſcarce any inſtance of a town being long inveſted without ſome fatal diſtemper of this kind. Sometimes it may be owing to the filth of a place, crouded with people and cattle brought in for ſhelter, as it once happened both at Athens[*] and at Rome[†]. At other times the ſickneſs has been occaſioned by corrupted grain[||], and meats long ſalted becoming half putrid.

Tho' the putrefaction of a vegetable ſubſtance is not to be reckoned nearly ſo fatal as that of animals, it is not, however, without danger: for, vegetables rotting in a cloſe place, yield a cadaverous ſmell; and we have inſtances of malignant fevers occaſioned by the *effluvia* of putrid cabbages *, as well as of plants in marſhes. Foreſtus imputes the plague at Delft, in the year 1557, to the eating of mouldy grain that had been long kept up by the merchants at the time of a dearth †. And I have heard it remarked, that in this Iſland the dyſentery is obſerved to be frequent among the common people in thoſe parts where they live wholly on grain, whenever the preceding crop has been damaged in a rainy ſeaſon, or kept in damp granaries.

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[*] DIODOR. *Sicul.* Bibliothec. Hiſt. Lib. XII. cap. xlv.

[†] TIT. LIV. Anno U. C. 291.

[||] JUL. CÆSAR de Bell. Civ. Lib. ii. in his account of the ſiege of Marſeilles.

Jails have been the frequent ſource of malignant fevers, and perhaps no where oftner than in this country. Lord Bacon makes the following obſervation, *The moſt pernicious infection next the plague is the ſmell of the jail, when the priſoners have been long and cloſe and naſtily kept, whereof we have had, in our time, experience twice or thrice; when both the judges that ſat upon the jail* ‖, *and numbers of thoſe who attended the buſineſs, or were preſent, ſickened upon it and died. Therefore it were good wiſdom, that in ſuch caſes the jail*

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* Dr. ROGERS's Eſſay on Epidemic Diſeaſes, p. 41.

† Obſervat. Lib. VI. obſ. ix.

‖ Viz. the priſoners.

*were aired before they be brought forth* *. It is probable, that one of the times pointed at by that noble author, was at the fatal aſſizes held at Oxford in the year 1577, of which we have a more particular account in Stowe's chronicle, in theſe words: *On the 4th, 5th and 6th days of July were the aſſizes held at Oxon, where was arraigned and condemned Rowland Jenkins, for a ſeditious tongue; at which time there aroſe amidſt the people ſuch a damp, that almoſt all were ſmothered. Very few eſcaped that were not taken.—Here died in Oxon, three hundred perſons; and ſickened there, but died in other places, two hundred and odd* †.

Of the ſame kind of infection we have an unhappy inſtance ſo freſh in our memory, that I need not have mentioned it here, had it not been to inform ſuch as live at a diſtance, or thoſe that are to come after us. In the year 1750, on the 11th of May (N. S.) the ſeſſions began at the Old-bailey, and continued for ſome days, in which time a great number of criminals were tried, and there was preſent in the court a greater multitude than uſually attends. The court at the Old-bailey is a room only about 30 feet ſquare. Now whether the air was at firſt tainted from the bar, by ſome of the priſoners, then ill of the jail-diſtemper, or by the general uncleanlineſs of ſuch perſons, is uncertain *; ſince, from the latter cauſe it will be eaſy to account for its corruption; eſpecially as it was then farther vitiated by the foul ſteams of the Bail-dock, and of the two rooms opening into the court, in which they were the whole day crouded together, till they were brought out to be tried †: and, as it appeared afterwards, theſe places had not been cleaned for ſome years. The poiſonous quality of the air was ſtill aggravated by the heat and cloſeneſs of the court, and by the perſpirable

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* Nat. Hiſt. Exp. 914.

† This account is confirmed by CAMBDEN, vid. Ann. Eliz.

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[*] It has been the cuſtom, ſome days before every ſeſſions, to remove all the malefactors from the other jails into Newgate, already too much crouded. At ſuch times three hundred will be confined within that narrow ſpace; and it is well known how naſty both this and all the reſt are kept.

[†] I have been informed, that at theſe ſeſſions about a hundred were tried, who were kept in theſe cloſe places as long as the court ſat, and that theſe rooms are each but 14 feet by 11, and ſeven feet high. The Bail-dock is a ſmall room taken off one of the corners of the court, but left open at the top; in which, during the trials, are put ſome of the malefactors that have been under the cloſeſt confinement in the jails.

ſpirable matter of a great number of all ſorts of people, penned up for moſt of the day, without breathing the free air or receiving any refreſhment. The bench conſiſted of ſix perſons*, whereof four died, together with two or three of the counſel, one of the under-ſheriffs, ſeveral of the Middleſex jury, and others preſent, to the amount of above

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* Viz. Of the Lord Mayor, one of the Lords Chief Juſtices, two of the Judges, one of the Aldermen, and the Recorder. Of theſe died Sir Samuel Pennant, Lord Mayor; Sir Thomas Abney and Baron Clarke, Judges; and Sir Daniel Lambert, Alderman. It was remarkable, that the Lord Chief Juſtice and the Recorder, who ſat on the Lord Mayor's right hand, eſcaped, whilſt he himſelf, with the reſt of the bench on his left, were ſeized with the infection; and that the Middleſex jury on the ſame ſide of the court loſt ſo many, whilſt the London jury, oppoſite to them, received no harm; and that of the whole multitude, one or two, or at moſt a ſmall number of thoſe that were on the ſide of the court to the Mayor's right hand, were taken ill. Some, unacquainted with the dangerous nature of putrid *effluvia*, have aſcribed both this circumſtance and the ſickneſs in general to a cold taken by opening a window, by which a ſtream of air was directed to the ſide of the court on the Lord Mayor's left hand: but it is to be obſerved, that the window was at the fartheſt end of the room from the bench, tho' that ſuffered moſt. Neither could the kind of the fever, nor the mortality attending it, be referred to any ſuch cauſe. It is therefore probable, that the freſh air directed the putrid ſteams to that part of the court above mentioned. This, indeed, muſt be granted, that all ſeptic particles that paſs into the blood become more active and fatal if the infected perſon catches cold, or by any means ſuffers a ſtoppage of perſpiration, the chief means by which the blood is freed from ſuch morbific matter.

forty in the whole; without making allowance for thoſe of a lower rank, whoſe death may not have been heard of, or including any that did not ſicken within a fortnight after the ſeſſions †.

It was ſaid, that the fever in the beginning had an inflammatory appearance ||, but that after large evacuations the pulſe ſunk, and was not to be raiſed by bliſters or cordials, and that the patients ſoon became delirious. Several had the *petechiæ*; and all that were ſeized with the fever died, excepting two, or three at moſt. Some eſcaped without a fever, by a looſeneſs coming on, which was eaſily cured. This ſickneſs, as far as appears, ſpread no farther, which was perhaps owing to the ſeaſon and to the weather, at that time cold from northerly winds.

By Dr. Huxham's obſervations * we find, that the ſame malignant fever has been frequent at Plymouth, at leaſt during the late war, from the number of priſoners confined

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† This number, and the other circumſtances relating to this diſaſter, I had from Mr. Alderman JANSSEN, then one of the Sheriffs, and who, by virtue of his office, was preſent all the time.

|| Vid. p. 295.

* Eſſay on fevers, Ch. V. VIII.

to that place, and the hoſpitals and other places crouded with men taken out of ſhips, either actually ill of the fever, or from a ſcorbutic habit that rendered them very liable to it.

It is remarkable how much leſs the plague, peſtilential fevers, hot ſcurvies and dyſenteries have prevailed in Europe within this laſt century: a bleſſing we can aſcribe to no other ſecond cauſe than to the improvement of every thing relating to cleanlineſs, and to the more general uſe of antiſeptics. Felix Platerus, phyſician at Baſil, in Switzerland, gives an account of ten different peſtilential epidemics (he calls them plagues) that afflicted that city in the ſpace of ſeventy years, all of them within his memory *. And all the authors of that age, throughout Europe, are full of the like obſervations. Foreſtus remarks, that in his time the plague was moſt frequent at Cologne and Paris, and aſcribes the cauſe to the multitude of the inhabitants and the naſtineſs of the ſtreets †; whereas at preſent both thoſe

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* Obſervat. Lib. II.

† *Coloniæ & Lutetiæ Pariſiorum, peſtis frequentiſſima eſt ob hominum frequentiam & ſorditiem platearum. Obſervat. Lib.* VI. *obſ.*

thoſe cities are in general healthful, and not peculiarly ſubject to any putrid diſeaſe. Timoni takes notice, that at Conſtantinople, the cleaner houſes were leſs liable to be infected with the plague than the dirty †.

As to diet, it may be obſerved, that beer, wine and ſpirituous liquors coming more into general uſe, have been a great means of ſuppreſſing putrid diſeaſes. Greens are likewiſe more univerſally uſed, and if the common people eat more meat than formerly, the richer eat leſs, ſo that the diet of both is improved. To this add the more general conſumption of tea and ſugar, which I have ſhewn elſewhere to be no inconſiderable antiſeptics *. How far all theſe things may be abuſed, or become productive of other diſtempers, is not now the queſtion.

For ſo great a city, London is at preſent perhaps one of the leaſt ſubject to malignant

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*obſ.* v. *ſchol.* At that time, the ſtreets not being paved, we may eaſily conceive how offenſive they muſt be in ſuch large and populous cities It will be proper to obſerve, that FORESTUS generally confounds the true plague with peſtilential or malignant fevers, and therefore he can only mean the laſt; ſince thoſe two cities were the leaſt liable to the true plague from their inland ſituation.

† Phil. Tranſ. abridged, Vol. VI. Part III. ch. ii. ſect. xxi.

* Append. Paper IV. Exp. xxvi.

fevers, the dyſentery, or other putrid diſeaſes; with all which it ſeems formerly to have been infeſted little leſs than others, notwithſtanding the natural advantages of its ſituation *. Even, ſince the days of Sydenham there appears to be a conſiderable alteration for the better; for, beſides that there has been no plague, we have known no malignant epidemic †, and few bilious fevers of a bad kind; or indeed, excepting the ſmall-pox or meaſles, any putrid or malignant diſtemper that could at all be called general ||. In ſome of the loweſt, moiſteſt and cloſeſt parts of the town, and amongſt the poorer people, ſpotted fevers and dyſenteries are now and then ſtill to be ſeen, which are ſcarce heard of among the people of better rank, living in more airy ſituations. Doubtleſs many things re-

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[*] Viz. In a climate not liable to great heats or cloſe weather, on a gravelly ſoil, and by a large river, not only ſupplying freſh water but freſh air, by the conſtant motion of the tides. Add, that the city ſtands in a wide plain, where the ſurrounding fields are kept pretty open.

[†] Such as he deſcribes in the *Schedula Monitoria.*

[||] It is not pretended that the foul air of the town alone could produce any of the diſtempers here alluded to, but that it might concur with the weather to make them more frequent, or the caſes worſe. It is to be regretted, that this excellent author ſo rarely mentions the ſtate of the weather, from having embraced an opinion, that diſeaſes depended on no manifeſt change of the air, but on ſome inſcrutable quality of it.

relating to theſe matters might be better ordered in this place; yet ſome of the main points are well regulated, ſuch as regard the privies, common ſhores, the ſupplies of freſh water; and the people are in general very cleanly.

The common dirtineſs of the ſtreets does not perhaps affect the health of the inhabitants of great cities; and tho' the more offenſive kind of it may concur with other things to render the air leſs healthful, yet it ſeems to have no direct influence in producing peſtilential diſeaſes. Stale urine abounds with a volatile alcaline ſalt, reſiſting putreſaction [*]; and the *fæces* are rendered leſs, if at all infectious, by means of a ſtrong acid combined with the parts that are really ſeptic [†]. The caſe is different in putrid diſeaſes, and eſpecially in the dyſentery, where the *fæces*, as we have already ſhown, are highly corrupted and contagious [‖].

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[*] Append Paper I. Exp. ii. iii.

[†] Vid. Append. Paper VII. Exp. xliii. Add the experiments of M. HOMBERG *ſur la matiere fecàle. Hiſt. de l'Acad. R. des Sciences. A.* 1711. HOFFMAN, *Med. Rat. Syſt. Tom.* I *Lib.* i. *ſect.* ii *cap* vii.

[‖] Vid. Part I. ch. iii. p. 24, 25, 26, 27, 28. Part II ch. ii. p. 103, 104. Part III. ch. vi. ſect. i. p. 258. ſect. iii.

I ſhall conclude this part of my ſubject with obſerving, that at the ſame time that great cities furniſh many materials for vitiating the air, they are alſo provided with two conſiderable antidotes: the firſt ariſes from the circulation of the air, by means of the conſtant motion of people and carriages, and of the draughts made by fires; the other depends on the great quantity of acid produced by fuel, the ſtrongeſt reſiſter of putrefaction.

II. Thus far the cauſes of the hoſpital and other malignant fevers ſeem to be ſufficiently aſcertained: but in what manner theſe act and produce the various ſymptoms within the body, is not ſo eaſily to be accounted for; and therefore what follows is to be conſidered as conjectures, like what were formerly propoſed about the *cauſa proxima* of the bilious fevers and dyſentery.

I conceive that the *miaſma* or ſeptic ferment (conſiſting of the *effluvia* from putrid ſubſtances) received into the blood, has a power of corrupting the whole maſs. Its reſolution, and ſometimes even its ſmell in the advanced ſtate of a malignant fever, the offenſiveneſs of the ſweats and other excretions, the livid ſpots, blotches and mortifications incident to this diſtemper, are proofs of what is here advanced. By this acrimony the nerves are affected with various ſpaſms; the pulſe is always quickened, at firſt raiſed, but ſoon depreſt upon the heart not being ſupplied with ſpirits, or from a reſolution of its fibres occaſioned by the putrefaction. I have produced inſtances elſewhere of the heart being ſo far relaxed in a real peſtilence, as to become uncommonly large by the ordinary force of the blood *.

Now, was putrefaction the only change made in the body by contagion, it were eaſy to cure ſuch fevers, at any period, by the uſe of acids or other antiſeptics. But, whereas we have obſerved, that the diſeaſe once formed is not to be removed by any ſuch means till the ſtated time of its decline, it ſeems, therefore, probable, that whilſt the ſeptic proceſs goes on, the fever is chiefly ſupported by an inflammation of the brain †;

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* Apend. Paper VII. Exp. xlvi.

† See the diſſections.

that it is to this circumſtance that moſt of the ſymptoms are owing; and that a cure cannot be expected till the obſtructing matter is reſolved or ſuppurated.

This laſt part of the theory is rendered more probable by obſerving the affinity between the ſymptoms of this fever and thoſe of the *low* and nervous kind, which do not depend upon any putrid cauſe. The ſinking of the pulſe, pale urine, uncritical ſweats, confuſion of the head, decay of ſtrength, dejection of ſpirits and *tremor* of the nerves, are common to both: and therefore, conſidering the appearance of the brain in thoſe who died of the hoſpital fever, it ſeems reaſonable to conclude, that theſe ſymptoms immediately depend upon an inflammation or ſuppuration of that part.

Another argument may be drawn from the cure. Thus, before the inflammation is fixed, the ſeptic particles may be expelled by ſweating; after that period, the moſt effectual method is to ſupport the ſtrength, but ſo as not to increaſe the inflammation. In the laſt ſtage or decline of the diſeaſe, the humours being reſolved by putrefaction, the ob-

obſtruction is thereby removed; at which time the ſtronger antiſeptic and cordial medicines have place, in order to correct and expell what is ſo much vitiated. In this low ſtate the volatiles are often neceſſary for raiſing the pulſe*; wine is a conſtant cordial; and not it only, but camphire, *ſerpentaria* and the Bark are endowed with ſtrong antiſeptic qualities †.

Theſe are all the remarks that I have made on the nature and cauſe of malignant fevers. In the deſcription I have endeavoured to diſtinguiſh them from all others, as far as could be done in diſtempers with ſymptoms ſo much alike. The nervous fevers are frequently accompanied with miliary eruptions, which have no reſemblance to the *petechiæ*, nor have I ever happened to ſee thoſe in the malignant ones*. The nervous fevers ſeem to belong to the inflammatory claſs, tho' incident to ſuch chiefly who are of a weak or lax habit. But whatever gives the firſt riſe to them, if they end in petechial ſpots, putrid ſweats, or become contagious, we may from thence ſafely conclude, that by the long continuance of the diſeaſe, the humours are reſolved and turned putrid; or, in other words, that the fever has changed into a malignant form.

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* The volatile alcaline ſalts have been recommended by ETMULLER, and other practitioners, in the cure of malignant and petechial fevers; tho' they have been condemned by ſome authors of the beſt authority, on account of a putrefying quality inherent in them: but it will be found by the experiments in the appendix, that this opinion is groundleſs, ſince all alcalines appear to be of an antiſeptic nature. Yet it is not for that intention they are given in the low ſtate of theſe fevers; but only as cordials, diaphoretics and diuretics: by which qualities, it is preſumed, they may be more efficacious towards raiſing the pulſe and expelling what is putrid, than hurtful by relaxing the fibres and reſolving the blood. However, it is from experience, and not theory, that I take upon me to recommend them here.

† Vid. Append. Paper II. Exp. xi. xii. xiii.

## C H A P. VIII.

### *Obſervations on the* ITCH.

IN the diviſion of the diſeaſes moſt incident to an army, this was the laſt mentioned. It is alſo of a contagious nature, but the infection is only communicated by the contact of a foul perſon, his cloaths, bedding, &c. and not by *effluvia*, as in the dyſentery and malignant fever. It is confined to the ſkin, and ſeems beſt accounted for by Leeuwenhoek, from certain ſmall inſects he diſcovered in the puſtules with the microſcope. So that the frequency of the itch in the army is not to be aſcribed to the change of air or diet ſoldiers undergo upon expeditions, but to the infection propagated by a few (who happen to have it at the firſt ſetting out) to others in the ſame ſhip, tent, or barrack †. But of all places, the hoſpitals are the moſt liable to the contagion, as receiving all ſorts of patients. Hence I have obſerved, that after the *criſis* of fevers, the itch generally appeared, tho' the perſon was free from it when admitted.

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* I ſuſpect the miliary puſtules muſt have eſcaped my notice, ſince ſo many authors mention their appearing together with the other.

One unacquainted with this diſtemper may, therefore, be apt to miſtake it for a miliary eruption; eſpecially as they bear a nearer reſemblance to each other than could be expected in two things of ſo different a nature. But, thoſe who know how ſeldom the miliary eruptions, and how frequently theſe others, are ſeen in the army, will be leſs liable to fall into this error. The two may be alſo diſtinguiſhed by the following marks; the miliary puſtules appear before the fever is over, are attended with little itching, and go off of themſelves; whereas the itch is not perceived till after the *criſis*, in the convaleſcent ſtate, when it increaſes daily and becomes very troubleſome.

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† Part I, ch. ii. p. 18.

Altho' an army cannot be entirely freed from the itch, the cure of each individual is perhaps more certain in this than in any other diſtemper, and by a method ſo well known that I ſcarce need mention it. This I have obſerved to be leaſt fallible with the common men, who having no change of dreſs, what they wore was purified at the ſame time that they themſelves were cured; whilſt an officer catching the diſtemper, run a hazard of keeping it longer, from the circulation of infection between his body and cloaths.

Sulphur is the ſpecific, being both more ſafe and efficacious than mercury. For, unleſs a mercurial ointment was to touch every part of the ſkin, there can be no certainty of ſucceſs; whereas by a ſulphurous one, a cure may be obtained only by partial unctions. It would ſeem that theſe, as well as other inſects, were killed by the ſteams of brimſtone, tho' only raiſed by the heat of the body. And as for the internal uſe of mercury, which ſome have accounted a ſpecific, we have known ſeveral inſtances in the hoſpital of men undergoing a compleat ſalivation for the cure of the *lues venerea*, without being freed from the itch.

The ointment was made in this manner:

℞ *Sulphur. viv.* ℥i. *Rad. Hellebor. alb. pulv. (vel Sal. Ammoniac. crud.)* ʒij. *Axung. porcin.* ℥ij. *M. F. Unguent.*

This quantity ſerved for four unctions, and the patient was rubbed every night. But to prevent any diſorder that might ariſe from ſtopping too many pores at once, a fourth part only of the body was rubbed at one time. Some are ſaid to cure the diſeaſe by anointing the legs alone; but that method was not tried.

Tho' the itch may be thus cured by one pot of ointment, it will be proper to renew the application, and to touch the parts moſt affected, for a few nights longer, till the ſecond quantity is alſo exhauſted. And in the worſt caſes, to ſubjoin the internal uſe of ſulphur, not with a view to purify the blood, but to diffuſe the ſteams more certainly through the ſkin: there being reaſon to believe, that the *animalcula* may ſometimes lie too deep to be thoroughly deſtroyed by external applications.

Now as theſe fumes may heat the blood at a time the perſpiration is ſo much impeded, it is proper that the patient ſhould keep all the while on a cool diet, and guard againſt cold. If of a full habit, or in any degree feveriſh, he ſhould be let blood and take phyſic: otherwiſe, neither of the two evacuations are neceſſary.

The nature of the itch has been often miſtaken, whilſt ſome have referred it to the leprous, and others to the ſcorbutic claſs of diſeaſes; whereas it ſeems to be a diſtemper *ſui generis*; at leaſt very different from either of thoſe two. The *pſora* of the Greek, and *ſcabies* of the Latin writers * have been generally ſuppoſed to be this very diſtemper. But, as this does not appear by the deſcription they give of them[*], I ſhould conclude, that tho' the cutaneous diſorders were formerly more frequent, and generally of a worſe kind than at preſent, yet, that the itch was either altogether unknown to the antients, or at leaſt uncommon in thoſe times: ſince no diſtempers ſeem to have been more particularly deſcribed by them than thoſe of the ſkin. And as to the ſcurvy, it may be obſerved, that in the marſhy parts of the Low Countries, where that diſtemper is moſt frequent, and of the worſt kind, the itch is unknown; and that, tho' the two diſeaſes may coincide on board our ſhips, they are conſidered as two diſtinct maladies (one, ariſing from the foul air and bad proviſions; and the other, from the uncleanlineſs of the perſon and contagion); and that each requires a different cure.

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* The one has been always tranſlated by the other. *Vid.* GORRAEI, *Defin.*

Both the *ſcabies* and the various kinds of the *impetigo*[§] of the ancients ſeem now-a-days to be all confounded under the general, but improper

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[*] Paulus Ægin. Lib. IV. c. ii. Celsus, Lib. V. c. xxviii.

[§] It is plain, that by the *impetigo*, Celsus means the *Lepra Græcorum*. Vid. loc. cit.

proper appellation of *ſcorbutic ſpots* or *ſcurfs* †. Theſe are chiefly diſtinguiſhed by the hardneſs of the ſkin in one or more parts of the body, attended with a dry ſcurf, ſometimes oozing puſtules, and always with ſome degree of itching. But, they are ſo far from being curable by externals only, that it is often dangerous to attempt to remove them in that manner. Here, it is neceſſary to change the humours by a ſpare diet, exerciſe, alterative mercurials and frequent purges of the ſaline kind. But theſe being no diſeaſes of the army, it would be improper to inſiſt longer upon them here.

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† The true ſcorbutic ſpots are of a livid colour, not commonly ſcurfy or raiſed above the ſkin, and are always attended with ſpungy and bleeding gums, ſwelled legs, and other manifeſt ſigns of a lax ſtate of the fibres and corruption of the blood. For a real ſcurvy imports a ſlow but general reſolution or putrefaction of the whole frame: whereas the *ſcabies*, *impetigo* or leproſy may be found to affect thoſe of a very different conſtitution.

# APPENDIX,

CONTAINING

# Experiments and Obſervations

UPON

SEPTIC and ANTISEPTIC Subſtances,

Read at ſeveral MEETINGS of the ROYAL
SOCIETY.

# APPENDIX.

## PAPER I.

*That* putrid *Subſtances are not to be called* alcaline; *that the alcaline Salts do not promote Putrefaction; and that there are ſeveral powerful Antiſeptics not taken Notice of.*

*Read June 28, 1750. here printed with a few alterations.*

ALTHO' an enquiry into the manner how bodies are reſolved by putrefaction, with the means of accelerating or preventing that proceſs, has been reckoned not only curious, but uſeful*; yet, we find it little proſecuted in an experimental way: nor is it to be wondered at, conſidering how offenſive ſuch operations are. But, as I have been led to make ſome experiments and remarks on this ſubject, from my having had an uncommon number of putrid diſtempers under my care in the hoſpitals of the army, I ſhall venture to lay before the Society what I have found ſomewhat different from the common opinion, as well as ſome facts, which, as far as I know, have not been mentioned before.

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* Ld Bacon calls, "the inducing or accelerating putrefaction a ſubject of very univerſal inquiry;" and ſays, "that it is of excellent uſe to enquire into the means of preventing or ſtaying putrefaction; which makes a great part of phyſic and ſurgery." See Nat. Hiſt. Cent. IV. Add, what is ſaid upon this ſubject by the celebrated Profeſſors Boerhaave and Hoffman; the former, in his aphoriſms *de Alcali Spontaneo*; and the latter, in his diſſertation *de Putred. Doctrin.* &c.

Finding it a received notion, that bodies by putrefaction became highly alcaline, I made the following experiments, to enquire how far this may be true.

## EXPERIMENT I.

THE *ſerum* of human blood putrified, made, with a ſolution of ſublimate, firſt a turbid mixture, and afterwards a precipitation. This is one of the teſts of an *alcali*, but ſcarce to be admitted here; ſince the ſame thing was done with recent urine (of a perſon in health) which is never accounted alcaline. The ſame *ſerum* did not tinge the ſyrup of violets green; and made no effervеſcence when the ſpirit of vitriol was poured upon it. I made the experiment twice upon portions of different *ſerum*, both highly putrid; and once on water, in which corrupted fleſh had been ſometime infuſed; and the moſt I could find was, that, having previouſly given the ſyrup a ſmall reddiſh caſt with an acid, this colour was rendered fainter, but not deſtroyed by the putrid humours. And as to effervеſcence, having dropped the ſpirit of vitriol into theſe liquors unmixed, and alſo diluted with water, the mixture was quiet, and only a few air-bubbles appeared on ſhaking the glaſſes. Upon the whole, tho' there were ſome marks of a latent *alcali* in the putrid *ſerum*, they were ſo very faint, that one drop of ſpirit of hartſhorn, diluted with a quantity of water equal to that of the putrid liquors, being put to the ſame trial, ſhewed more of an alcaline nature than any of the other.

## EXPERIMENT II.

IT has been a maxim, that all animal ſubſtances, after putrefaction, being diſtilled, ſend forth a great quantity of volatile ſalt in the firſt water; but Mr. Boyle found, that this held good only in urine; and that in the diſtillation of the *ſerum* of human blood putrefied, the liquor which came over firſt had little ſtrength, either as to its ſmell or taſte, and did not at firſt effervefce with an acid *. And here it may be obſerved, that the Chemiſts have generally applied thoſe properties they diſcovered in urine, to all the humours indifferently; whereas, in fact, there is a great diverſity. For, ſome animal ſubſtances, ſuch as urine, the bile and the *craſſamentum* of the blood, ſoon putrefy; the *ſerum*, the *ſaliva*, and the white of an egg, ſlowly. Yet thoſe that ſooneſt corrupt, do not always arrive at the higheſt degree of putrefaction. Thus the bile is ſoon corruptible, but the rankneſs of it is not to be compared to that of fleſh; and the white of an egg is not only much leſs diſpoſed to putrefy than the yolk, but, when corrupted, yields a different and leſs offenſive ſmell. And it ſeems peculiar to ſtale urine to contain an alcaline ſalt, which, without diſtillation, makes a ſtrong effervefcence with acids. Whereas, moſt other animal humours putrefied, tho' of a more intolerable *fœtor*, yet contain leſs volatile ſalt, leſs extricable, and not effervefcing with acids. But, what makes the difference between ſtale urine and other putrid ſubſtances ſtill more ſpecific, is its inoffenſiveneſs with regard to health; whilſt the ſteams of moſt other corrupted bodies are often the cauſe of putrid and malignant diſeaſes.

Now, upon finding in urine a much greater quantity of volatile ſalt, and that more eaſily ſeparable than in any other humour, and that ſtale urine is the leaſt noxious of putrid animal ſubſtances, ſo far then from dreading the volatile *alcali* as the deleterious part of corrupted bodies, from this inſtance we may rather infer it to be a ſort of corrector of putrefaction.

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* Vid. Nat. Hiſt. of Human Blood, in Vol. IV. p. 178. fol.

## EXPERIMENT III.

DAILY experience ſhews how harmleſs the volatiles are, both when ſmelled to, or taken in ſubſtance; but ſtill there remains a prejudice, as if theſe ſalts, being the produce of corruption, ſhould therefore haſten putrefaction; not only in diſtempers where they are unwarily taken, but alſo in experiments out of the body.

Now, as to the effects ariſing from the internal uſe of them, little can be ſaid, unleſs the kind of diſeaſe was preciſely ſtated. For, ſuppoſing they were by their nature diſpoſed to promote putrefaction; yet, if that is already begun, from a *languor* of circulation and obſtruction, then may the volatiles, by their ſtimulating and aperient quality, be the means of ſtopping its progreſs: and on the other hand, tho' they were really antiſeptic, yet, if the humours are diſpoſed to corrupt from exceſs of heat or motion, theſe very ſalts, by adding to the cauſe, may augment the diſeaſe. So that upon the whole, it will be the faireſt criterion of the nature of theſe volatiles, to enquire, whether out of the body, they accelerate or retard putrefaction.

1. In order to decide this queſtion, I have made repeated experiments of joining both the ſpirit and the ſalt of hartſhorn to various animal ſubſtances; and have conſtantly found, that, ſo far from promoting putrefaction, they have evidently hindered it; and that with a power proportioned to their quantity *. The trials have been made with the *ſerum* of the blood, and alſo with the *craſſamentum*, after it had been dried by keeping. I once

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* Mr. BOYLE had already obſerved, that by adding to blood, whilſt warm, fine urinous ſpirits, they would make it look more florid, keep it more fluid, and long preſerve it from putrefaction. Abrid. vol. III. p. 451. This paſſage muſt be in the large work, tho' I could not fall upon it when I wanted to make the reference.

ſeparated the thick inflammatory cruſt of pleuritic blood from the reſt of the maſs; and, dividing it, put one portion into diſtilled vinegar, the other into ſpirit of hartſhorn; and after keeping the infuſions above a month, in the middle of ſummer, I found the piece which lay in the alcaline ſpirit as ſound as that in the acid.

2. Another time, I put in one phial about an ounce and an half of an equal mixture of ox's gall and water, with 100 drops of ſpirits of hartſhorn; and in another, as much of the gall and water without any ſpirit. The phials, being corked, were ſet by a fire, ſo as to receive about the degree of animal heat; whereby, in leſs than two days, the mixture without the ſpirit became putrid; but the other was not only then, but after two days longer, untainted.

3. I afterwards infuſed two drachms of the lean of beef, with two ounces of water, and half a drachm of ſalt of hartſhorn. Another phial contained as much fleſh and water, with a double quantity of ſea-ſalt. In a third was the fleſh and water only, to ſerve by way of index. Theſe phials were placed in a lamp-furnace, in a heat varying between 94 and 100 degrees of Fahrenheit's ſcale. About 18 hours after infuſion, the contents of that phial which ſerved as an index, were rank; and in a few hours more, that with the ſea-ſalt was alſo putrid; but the fleſh with the volatile alcali was ſound, and continued ſo after ſtanding 24 hours longer in the ſame degree of heat. And that the ſmell of the hartſhorn might occaſion no deception, the piece of fleſh was waſhed from the ſalt, and ſtill ſmelled ſweet.

4. About the ſame time, I took three pieces of freſh beef, of the ſame weight as above; and laying two of them in gally-pots, I covered one with ſaw-duſt, and the other with bran; but the third piece being ſtrew'd with ſalt of hartſhorn powdered, I put into a four-ounce phial which had a glaſs ſtopper. They were all three placed on the outſide of a window, expoſed to the ſun; and the weather being warm, on the third day, the fleſh in the gally-pots began to ſmell; on the fourth were putrid.

Next day the phial was examined, when the fleſh was waſhed from the ſalt, and found quite ſweet. It was then dried and ſalted again with hartſhorn; and having ſtood in the houſe ſome weeks longer, in ſultry weather, it was looked at a ſecond time, and obſerved to be as ſound as before: neither was the ſubſtance at all diſſolved, but was of ſuch a conſiſtence as might be expected from common brine*. And, leſt it might be ſuſpected, that the fleſh in the gally-pots, by being more expoſed to the air than that in the phial, became ſooner putrid, I have ſince incloſed fleſh in phials, as that with the hartſhorn, and found the confinement rather haſten the putrefaction.

Now, by theſe and many other experiments of the kind, finding that volatile alcaline ſalts not only do not diſpoſe animal ſubſtances to putrefaction out of the body, but even prevent it, and that more powerfully than common ſea-ſalt, we may preſume, that the ſame taken by way of medicine, will, *cæteris paribus*, prove antiſeptic; at leaſt, we cannot juſtly ſuppoſe them corrupters of the humours, more than fermented ſpirits or ſea-ſalt; which taken in immoderate quantities may raiſe a fever, and thereby accidentally be the occaſion of corruption.

### EXPERIMENT IV.

I HAVE likewiſe made ſeveral experiments with the fixed alcaline ſalts, which have no leſs antiſeptic powers than the volatile. The trials were made both with the lye of tartar and ſalt of wormwood. But here, we muſt not confound a diſagreeable ſmell of ſuch mixtures, with one that is really putrid; nor the power thoſe lixivials have of diſſolving animal ſubſtances, with putrefaction.

### EXPERIMENT V.

FROM theſe experiments it was natural to conclude, ſince acids by themſelves were amongſt the moſt powerful antiſeptics, and the alcaline ſalts were likewiſe of that claſs, that the mixtures of the two, to ſaturation, would reſiſt putrefaction little leſs than the acid alone. But in the trials I have made upon fleſh with a *ſpiritus Mindereri*, compoſed of vinegar ſaturated with ſalt of hartſhorn, and alſo with the juice of lemons ſaturated with the ſalt of wormwood, I found the antiſeptic virtue conſiderably leſs than when either the acids or *alcali's* were uſed ſingly.

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* The ſame piece has been ſince kept a twelvemonth, and is ſtill untainted, and as firm as at firſt.

## EXPERIMENT VI.

As for the comparative virtues of theſe ſalts upon fleſh, I found half an ounce of lemon-juice, ſaturated with a ſcruple of the ſalt of wormwood, reſiſted putrefaction nearly as much as fifteen grains of nitre; but when the trial was made with ox's gall, two drachms of this mixture were more antiſeptic than a ſcruple of that ſalt. Again, nitre compared with the dry neutral ſalts, weight for weight, is more antiſeptic than any I have yet tried in preſerving fleſh. Crude *ſal ammoniacum* came next to it, and even exceeded it in the experiment with ox's gall. After theſe, the *ſal diureticus*, *tartarus ſolubilis*, and *tartarus vitriolatus* ſeemed to have nearly the ſame power.

## EXPERIMENT VII.

Thus far have we conſidered the common neutral ſalts; which, however powerful in reſiſting putrefaction, are inferior to ſome reſinous ſubſtances, and even ſome vegetables which I have tried. Thus myrrh, in a watry *menſtruum*, was found at leaſt twelve times more antiſeptic than ſea-ſalt. Two grains of camphire mixed with water, preſerved fleſh better than ſixty grains of that ſalt: and I imagine, could the camphire be kept from flying off, or concreting to the ſides of the phial, that half a grain, or even leſs, would have ſufficed. An infuſion of a few grains of Virginian ſnake root in powder exceeded twelve times its weight of ſea-ſalt. Chamemile-flowers have nearly the ſame extraordinary quality. The Jeſuit's Bark has it alſo; and if I have not found it ſo ſtrong as the two ſubſtances laſt mentioned, I impute that in part to my not being able to extract its embalming parts in plain water.

Now, vegetables poſſeſſing this balſamic quality, are the more valuable, in that, being uſually free of acrimony, they may be taken in much greater quantities, than either ſpirits, acids, reſins, or even the neutral ſalts. And as in the great variety of ſubſtances anſwering this purpoſe, there may be alſo ſome offenſive or uſeful qualities annexed, it may not be amiſs, perhaps, to review ſome part of the *materia medica* for this intention.

I ſhall add, that beſides this extraordinary power in preſerving bodies, I have diſcovered in ſome of theſe ſubſtances a ſweetening or correcting quality, after putrefaction had actually begun. But theſe experiments I ſhall lay before the Society ſome other time; with a Table of the comparative force of ſalts, and ſome farther remarks on the ſame ſubject.

## PAPER II.

### *A Continuation of the Experiments on Subſtances reſiſting Putrefaction.*

*Read Nov.* 21, 1750. HAVING in my laſt paper in the preceding number of theſe Tranſactions, p. 480, *&c.* juſt mentioned the comparative force of a few ſalts, and other ſubſtances reſiſting putrefaction, I ſhall now lay before the Society a particular account of thoſe experiments, with ſome others ſince made, on that ſubject.

### EXPERIMENT VIII.

THREE pieces of the lean of freſh beef, each weighing two drachms, were put ſeparately into wide-mouth'd phials. Two ounces of ciſtern-water were added to each; in one were diſſolved 30 grains of ſea-ſalt †; in another 60; but the third contained nothing but fleſh and water. Theſe bottles were little more than half full; and, being corked, were placed in a lamp-furnace, regulated by a thermometer, and kept about the degree of human heat.

About ten or twelve hours after, the contents of the phial without ſalt had a faint ſmell; and in three or four hours more were putrid*. In an hour or two longer, the fleſh with the leaſt ſalt was tainted; but that which had moſt, remained ſweet above 30 hours after infuſion. This experiment was often repeated with the ſame reſult, making allowance for ſmall variations in the degree of heat.

The uſe of the experiment was for making ſtandards, whereby to judge of the ſeptic or antiſeptic ſtrength of bodies. Thus, if water with any ingredient preſerved fleſh better than without it, or better than with the addition of the ſalt, that ingredient might be ſaid to reſiſt putrefaction more than water alone, or with 30 or 60 grains of ſea-ſalt. But if, on the other hand, water, with any addition, promoted corruption more than when pure, the ſubſtance added was to be reckoned a ſeptic, or haſtener of putrefaction.

The following experiments were therefore all made in the ſame degree of heat, with the quantity of fleſh, water, and air, as above ſpecified; together with ſuch ſeptic or antiſeptic ſubſtances as ſhall be afterwards mentioned, and were all compared with the ſtandards. But, whereas the leaſt quantity of ſalt preſerved fleſh little longer than plain water, I ſhall always compare the ſeveral antiſeptic bodies with the greateſt quantity: ſo that whenever any ſubſtance is ſaid to oppoſe putrefaction more than the ſtandard, I mean, more than 60 grains of ſea-ſalt.

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† All theſe experiments were made with the white or boiled ſalt in common uſe here.

* Theſe pieces were entire; but when they are beat to the conſiſtence of a pap, with the ſame quantity of water, the putrefaction begins in leſs than half the time mentioned above.

## EXPERIMENT IX.

I THEN examined other ſalts, and compared them, in the ſame quantity, with the ſtandard; which being of all the weakeſt, I ſhall ſuppoſe it equal to unity, and expreſs the proportional ſtrength of the reſt in higher numbers, as in the following table.

*A Table of the comparative Powers of Salts in reſiſting Putrefaction.*

| | |
|---|---|
| Sea-ſalt | 1 |
| *Sal gemmæ* | 1 + |
| Tartar vitriolated | 2 |
| *Spiritus Mindereri* | 2 |
| *Tartarus ſolubilis* | 2 |
| *Sal diureticus* | 2 + |
| Crude *Sal ammoniacum* | 3 |
| Saline mixture | 3 |
| Nitre | 4 + |
| Salt of hartſhorn | 4 + |
| Salt of wormwood | 4 + |
| Borax | 12 + |
| Salt of amber | 20 + |
| Alum | 30 + |

In this table I have marked the proportions by integral numbers; it being hard, and perhaps unneceſſary, to bring this matter to more exactneſs; only to ſome I have added the ſign +, to ſhew, that thoſe ſalts are ſtronger than the number in the table by ſome fraction; unleſs in the three laſt, where the ſame ſign imports, that the ſalt may be ſtronger by ſome units *. The tar-

tar

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* Five grains of Borax was the ſmalleſt quantity compared with 60 gr. of ſea-ſalt; but holding out ſo much longer, I ſuſpect

three

tar vitriolated is rated at 2; tho' more than 30 of it was taken to equal the ſtandard; but perceiving all of it was not diſſolved, an allowance was made accordingly. On the other hand, as part of the hartſhorn flies off, its real force muſt be greater than what appears by the table. The ſalt of amber is likewiſe volatile; and as three grains of it were found more preſervative than 60 grains of ſea-ſalt, it may therefore be much more than 20 times ſtronger. This is indeed an acid ſalt, but as the acid part of it is inconſiderable, this high antiſeptic power muſt be owing to ſome other principle. The *ſpiritus Mindereri* was made of common vinegar and ſalt of hartſhorn; the ſaline mixture, of ſalt of wormwood ſaturated with lemon-juice. The alcaline part in either of theſe mixtures, with water only, would have reſiſted with a power of 4 +; ſo that the acid added, rendered theſe ſalts leſs antiſeptic; *viz.* the *ſpiritus Mindereri* by a half, and the ſaline mixture by a third part: which was a circumſtance very unexpected.

## EXPERIMENT X.

1. I PROCEEDED to try reſins and gums, and began with myrrh. As part of this ſubſtance diſſolves in water, eight grains were made into an emulſion; but moſt of it ſubſiding, I could not reckon on a ſolution of more than one or two grains; which, nevertheleſs, preſerving the fleſh longer than the ſtandard, we may account the ſoluble part of Myrrh, perhaps, about 30 times ſtronger than ſea-ſalt.

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three gr. would have been ſufficient; in which caſe the force of this ſalt was to be eſtimated at 20: a ſingular inſtance of the ſtrength of a ſalt, which, ſo far from being acid, is of an urinous taſte. One grain of alum was weaker than 60 grains of ſea-ſalt; but two grains were ſtronger. The power therefore of alum lies between 30 and 60; but, as I could judge by the experiment, nearer the firſt number.

2. Aloes, *aſa fœtida*, and the *terra japonica*, diſſolved in the ſame manner as myrrh, like it ſubſided, and with the ſame antiſeptic force. But gum-ammoniac and *ſagapenum* ſhewed little of this virtue. Whether it was, that they oppoſed putrefaction leſs, or that all the antiſeptic principle fell with the groſſer parts to the bottom. Three grains of opium diſſolved in water did not ſubſide, and reſiſted putrefaction better than the ſalt. But I obſerved, that more air than uſual was generated, and the fleſh became tenderer than with any of the ſtronger antiſeptics.

3. Of all the reſinous ſubſtances, camphire reſiſted moſt. Two grains diſſolved in one drop of ſpirit of wine, five grains of ſugar, and two ounces of water, exceeded the ſtandard; tho', during the infuſion, moſt of the camphire flew off, ſwam at top, or ſtuck to the phial. Suppoſe only the half loſt, the remainder is at leaſt 60 times ſtronger than ſalt; but if, as I imagine, the water ſuſpended not above a tenth part; then, camphire will be 300 times more antiſeptic than ſea-ſalt. That nothing might be aſcribed to the minute portion of the ſpirit uſed in this experiment, I made another ſolution of camphire in a drop or two of oil, and found this mixture leſs perfect, but ſtill beyond the ſtandard.

## EXPERIMENT XI.

1. I MADE ſtrong infuſions of chamemile-flowers, and of Virginian ſnake-root; and finding them both greatly beyond the ſtandard, I gradually leſſened the quantity of theſe materials, till I found five grains of either impart a virtue to water ſuperior to 60 grains of ſalt. Now, as we cannot ſuppoſe that theſe weak infuſions contained half a grain of the embalming part of theſe vegetables, it follows, that this muſt be at leaſt 120 times more antiſeptic than common ſalt.

2. I alſo made a ſtrong decoction of the Bark, and infuſed a piece of fleſh in two ounces of it ſtrained; which fleſh never corrupted, tho' it remained two or three

days in the furnace, after the ſtandard was putrid. During this time the decoction became gradually limpid, whilſt the groſſer parts ſubſided: by which it appears, that a moſt minute portion of the Bark (perhaps leſs than of the ſnake-root or chamemile-flowers) intimately mixed with water, is poſſeſſed of very extraordinary antiſeptic virtues.

3. Beſides theſe, pepper, ginger, ſaffron, contrayerva-root, and galls, in the quantity of five grains each, as alſo ten grains of dried ſage, of rhubarb, and of the root of wild valerian *, ſeparately infuſed, exceeded 60 grains of ſalt. Mint, angelica, ground-ivy, ſenna, green tea, red roſes, common wormwood, muſtard, and horſe-raddiſh, were likewiſe infuſed, but in larger quantities, and proved more antiſeptic than the ſtandard. And as none of theſe can be ſuppoſed to yield in the water above a grain or two of the embalming principle, we may look upon them all as very powerful reſiſters of putrefaction. Farther, I made a trial with a decoction of white poppy-heads, and another with the expreſſed juice of lettuce, and found them both above the ſtandard.

By theſe ſpecimens we may now ſee how extenſive antiſeptics are; ſince, beſides ſalts, fermented ſpirits, ſpices and acids, commonly known to have this property, many reſins, aſtringents and refrigerants are of the number; and even thoſe plants called anti-acids, and ſuppoſed haſteners of putrefaction: of which claſs horſe-raddiſh is particularly antiſeptic. And indeed, after theſe trials, I expected to find all diſſolvable ſubſtances endowed with ſome degree of this quality; till, upon farther experiments, I perceived ſome made no reſiſtance, and others promoted corruption. But, before I enter upon that part of my ſubject, it will be proper to

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* Tho' the experiment was only made with ten grains of the powder of this root, yet, conſidering how long that quantity reſiſted putrefaction, we may reckon the valerian among the ſtrongeſt antiſeptics.

relate ſome other experiments more nearly connected with the preceding.

## EXPERIMENT XII.

HAVING ſeen how much more antiſeptic theſe infuſions were than ſea-ſalt, I then tried whether plants would part with this virtue without infuſion. For this purpoſe, having three ſmall and thin ſlices of the lean of beef, I rubbed one with the powder of the Bark, another with ſnake-root, and a third with chamemile-flowers. It was in the heat of ſummer, yet, after keeping theſe pieces for ſeveral days, I found the fleſh with the Bark but little tainted, and the other two quite ſweet. The ſubſtance of all the three was firm; particularly that with the chamemile, which was ſo hard and dry, that it ſeemed incorruptible. Why the Bark had not altogether the ſame effect, was probably owing to its cloſe texture.

## EXPERIMENT XIII.

I HAVE alſo made ſome attempts towards the ſweetening of corrupted fleſh, by means of mild ſubſtances; becauſe diſtilled ſpirits, or ſtrong acids, the only things known to anſwer this intention, were of two acrid and irritating a nature to be thoroughly uſeful, when this correction was moſt wanted. As for ſalts, beſides their acrimony, it is well known, that meat once tainted will not take ſalt.

A piece of fleſh weighing two drachms, which in a former experiment had become putrid (and was therefore very tender, ſpongy and ſpecifically lighter than water) was thrown into a few ounces of the infuſion of chamemile-flowers, after expreſſing the air, to make it ſink in the fluid. The infuſion was renewed twice or thrice in as many days; when perceiving the *fœtor* gone, I put the fleſh into a clean bottle, with a freſh infuſion; and this I kept all the ſummer, and have it ſtill by me, quite ſweet, and of a firm texture *. In like manner I have been able to ſweeten ſeveral ſmall pieces of putrid fleſh, by repeated affuſions of a ſtrong decoction of the Bark; and I conſtantly obſerved, that not only the corrupted ſmell was removed, but a firmneſs reſtored to the fibres.

Now, ſince the Bark parted with ſo much of its virtue in water, it was natural to think it would ſtill yield more in the body, when opened by the *ſaliva* and bile; and therefore, that it was by this antiſeptic virtue it chiefly operated. From this principle we might account for its ſucceſs in gangrenes, and in the low ſtate of malignant fevers, when the humours are ſo evidently putrid. And for intermitting fevers, in which the Bark is moſt ſpecific, were we to judge of their nature from circumſtances attending them in climates and ſeaſons moſt liable to the diſtemper, we ſhould aſſign putrefaction as a principal cauſe. They are the great endemic of all marſhy countries, and rage moſt after hot ſummers, with a cloſe and moiſt ſtate of the air. They begin about the end of ſummer, and continue through autumn; being at the worſt when the atmoſphere is moſt loaded with the *effluvia* of ſtagnating water, rendered more putrid by vegetables and animal ſubſtances that die and rot in it. At ſuch times all meats are quickly tainted; and dyſenteries, with other putrid diſeaſes, coincide with theſe fevers. The heats diſpoſe the humours to acrimony; the putrid *effluvia* are a ferment §; and the fogs and dews, ſo common to thoſe climates, ſtop perſpiration and bring on a fever. The more theſe cauſes prevail, the eaſier it is to trace this putrefaction of humours. The *nauſea*, thirſt, bitter taſte of the mouth, and frequent evacuations of putrid bile are common ſymptoms, and arguments for what is advanced. We ſhall add, that in moiſt countries, in bad ſeaſons, the intermittents not only begin with ſymptoms of a putrid fever, but, if unduly managed, eaſily change into a peſtilential or malignant form, with livid ſpots and blotches, and mortification of the bowels. But, as a thorough diſcuſſion of this queſtion might carry us too far from our preſent ſubject, and be unſeaſonable here, I ſhall refer it to its proper place, and only remark, that whatever medicines (beſides evacuations and the Bark) have been found uſeful in the cure of intermittents, they are ſo far as I know, all highly antiſeptic; ſuch are myrrh, camphire, chamemile-flowers, wormwood, tincture of roſes, alum with nutmeg, vitriolic or ſtrong vegetable acids with aromatics.

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* This piece has been kept a twelvemonth in the ſame liquor, and is ſtill firm and uncorrupted.

§ It will be proper to remark, that when I uſe here (as in the preceding OBSERVATIONS) the word *ferment* to denote the cauſe that changes the humours, I mean only to expreſs the aſſimilating power of all putrid animal ſubſtances over the freſh, as ſhall be explained more fully in the next Paper, under Experiment xviii. There ſeemed to be the more need for this caution, as in one of the ſubſequent Papers I am to ſhew, that putrid animal ſubſtances become ferments, in the ſtricteſt

Thus far I have only recited my experiments upon fleſh, or the fibrous parts of animals; I ſhould next proceed to ſhew, what effects antiſeptics have upon the humours: for, tho' from analogy we may conclude, that whatever retards the corruption of the ſolids, or recovers them after they are tainted, will act ſimilarly upon the fluids; yet, as this does not certainly follow, I judged it neceſſary to make new trials; which, with ſome experiments on the promoters of putrefaction, the reverſe of the former, ſhall be offered to the Society at another meeting.

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ſtricteſt ſenſe; that is, act as yeaſt, when joined to any vegetable ſubſtances capable of a vinous fermentation. Vid. Exper. xxviii. et ſeq.

# PAPER III.

## *Further Experiments on Subſtances reſiſting Putrefaction; with Experiments upon* ſeptics, or *the means of haſtening and promoting that Proceſs.*

*Read Nov.* 15, 1750.

HAVING given a particular account of the manner of trying antiſeptics on the fibrous parts of animals, I ſhall only mention the reſult of ſome experiments made with them upon the humours*.

### EXPERIMENT XIV.

DECOCTIONS of wormwood and of the Bark, alſo infuſions of chamemile-flowers, and of ſnake-root, preſerved yolks of eggs, not only ſeveral days longer than water did alone, but alſo when a good quantity of ſea-ſalt was added to it. I likewiſe found, that ſalt of hartſhorn preſerved this ſubſtance better than four times its weight of ſea-ſalt.

### EXPERIMENT XV.

OX's gall was kept ſome time from putrefaction by ſmall quantities of lye of tartar, ſpirit of hartſhorn, crude *ſal ammoniacum* and the ſaline mixture; and ſtill longer by a decoction of wormwood, infuſions of chamemile-flowers, and of ſnake-root; by ſolutions of myrrh, camphire, and ſalt of amber: all were ſeparately mixed with gall, and found more antiſeptic than ſea-ſalt, and ſeemingly in proportion to their effects upon fleſh. Only nitre failed; which, tho' four times ſtronger than ſea-ſalt in keeping fleſh ſweet, is inferior to it in preſerving gall; and remarkably weaker than crude *ſal ammoniacum*, which again is ſomewhat leſs powerful than nitre in preſerving fleſh. The nitre was ſoon opened by the gall, and emitted a vaſt quantity of air, which roſe as from a fermenting liquor; and when this happened, the gall began to putrefy. But the ſaline mixture generated no air, and oppoſed the putrefaction of the gall more than it did that of fleſh.

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* All the following experiments, whether made in the lamp-furnace, or by the fire, were in a degree of heat equal to that of the human blood, viz. about 100 degrees of FAHRENHEIT's ſcale.

## EXPERIMENT XVI.

THE laſt trial was with the *ſerum* of human blood, which was preſerved by a decoction of the Bark, and an infuſion of ſnake-root, nor with leſs efficacy than fleſh. But, ſaffron and camphire were not here above a fourth part ſo antiſeptic as before; whether it be that they are leſs preſervative of this humour, or, as I ſuſpect, that they were not well mixed. Nitre acted nearly with its full force, being about four times ſtronger than ſea-ſalt: and it generated ſome air, but much leſs than it did with the gall. No other humour was tried; but, from theſe ſpecimens added to the former experiments, we may conclude, that whatever is preſervative of fleſh will be univerſally antiſeptic, tho' perhaps not always with equal force.

## EXPERIMENT XVII.

HAVING already ſhewn how putrid fleſh might be ſweetened, I ſhall conclude this part of my ſubject with a like trial upon the yolk of an egg. A portion of this being diluted with water, ſtood till it corrupted; when a few drops were put into a phial with two ounces of pure water, and about twice as many drops were mixed with a ſtrong infuſion of chamemile-flowers. At firſt, both phials had ſome degree of a putrid ſmell; but being corked, and kept a few days near a fire, the mixture with plain water contracted a ſtrong *fœtor*, whilſt the other ſmelled only of the flowers.

Thus far have I related the experiments made of antiſeptics; by which it appears, that, beſides ſpirits, acids and ſalts, we are poſſeſſed of many powerful reſiſters of putrefaction, endowed with qualities of heating, cooling, volatility, aſtriction, and the like; which make ſome more adapted than others to particular indications. In ſome putrid caſes, many proper antiſeptics are already known; in others, they are wanting. We are yet at a loſs how to correct the *ſanies* of a cancerous ulcer; but, from ſuch a multitude of antiſeptics, it is to be hoped, ſome may be found, at laſt, adequate to that intention. It may be farther remarked, that, as different diſtempers of the putrid kind require different antiſeptics, ſo the ſame diſeaſe will not always yield to the ſame medicine. Thus the Bark will fail in a gangrene, if the veſſels are too full, or the blood ſizy: but, if the veſſels are relaxed, and the blood diſſolved or diſpoſed to putrefaction, either from a bad habit or the abſorption of putrid matter, then is the Bark a good ſpecific. With the ſame caution are we to uſe it in wounds; *viz.* chiefly in caſes of abſorbed matter, which infects the humours and induces a hectic fever. But, when inflammatory ſymptoms prevail, the ſame medicine increaſing the tenſion of the fibres and ſizineſs of the blood, a ſtate directly oppoſed to the other, has ſuch conſequences as might be expected.

By the ſucceſs of the Bark in ſo many putrid caſes, it ſhould appear, that aſtriction had no ſmall ſhare in the cure. And, indeed the very nature of putrefaction conſiſts in a ſeparation or diſunion of the parts. But as there are other caſes, in which aſtringency is leſs wanted, we may find in contrayerva-root, ſnake-root, camphire, and other ſubſtances, a highly antiſeptic power, with little or none of the other quality. And ſince ſeveral of theſe medicines are alſo diaphoretic, their operation is thereby rendered more ſucceſsful.

I come now to the ſecond thing propoſed, which was, to give an account of ſome obſervations made on ſubſtances haſtening or promoting putrefaction; an enquiry not leſs uſeful than the former. For, ſetting aſide the offenſive idea commonly annexed to the word, we muſt acknowledge putrefaction to be one of the inſtruments of nature, by which many great and curious changes are brought about. With regard to medicine, we know, that neither animal nor vegetable ſubſtances can become aliment, without undergoing ſome degree of putrefaction. Many diſtempers proceed from a deficiency of this action*. The *criſis* of fevers ſeems to depend upon it†;

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* Some authors of great repute mean the ſame thing, when they expreſs this by a defect of a due degree of *alcaleſcence* in the humours; but I have ſhewed in my firſt Paper how liable this term was to objections.

† It is obſervable, that Hippocrates has entertained the ſame idea, ſince he oftner than once uſes the word, ſignifying *to putrefy*, as ſynonymous to that which ſignifies *to concoct*. Thus the learned Gorræus remarks, *Σήπειν, quod eſt putrefacere,* Hippocrati *concoquere ſignificat; ut et σῆψις concoctionem. Vid. Definit.* And agreeably to this Hippocrates *(in Lib. de Dietu)* makes uſe alſo of this phraſe, εὐσηπτὸς διαχώρημα *putrefactæ fæces*, which has been commonly rendered *alvi egeſtio concocta*. Now, that the concoction of the humours is nothing elſe but a putrefaction, ſeems probable from hence, that whenever they are in that ſtate, they are always more fluid, and fitter to paſs through the ſmaller veſſels, where they ſtagnated before. But, *reſolution* or tenuity is one inſeparable character of putrefaction. And often from the offenſiveneſs of the ſweats, or other excretions conſequent on a *criſis*, we find then indiſputable marks of a high degree of corruption. The time of *reſolution* or putrefaction depends on the degree of heat, the habit of the patient, and on the part obſtructed; hence ſuch a variety in the duration of fevers of different kinds, and uniformity in others that are of a like nature. *Reſolution* is the putrefaction of the impacted humour only; but ſuppuration ſuppoſes a corruption of the veſſels alſo. This manner of ſpeaking has been diſuſed from this

and even animal heat, according to Dr. Stevenſon's late ingenious theory §.

But, in the proſecution of this ſubject, I have met with very few real ſeptics; and found many ſubſtances, commonly accounted ſuch, of a quite oppoſite nature. The moſt general means of accelerating putrefaction, is by heat, moiſture, and ſtagnating air; which being ſufficiently known and aſcertained, I paſſed over, without making any particular experiment on thoſe heads. Lord Bacon ‡, as well as ſome of the Chemiſts, has hinted at a putrid fermentation, analogous to what is found in vegetables; and this having ſo near a connexion with contagion, I made the following experiment, for a farther illuſtration of the matter.

## EXPERIMENT XVIII.

In the yolk of an egg, already putrid, a thread being dipped, a ſmall portion was cut off and put into a phial, with half of the yolk of a new-laid egg diluted with water. The other half, with as much water, was put into another phial, and both being corked, were ſet by the fire to putrefy. The reſult was, that the thread infected the freſh yolk; for, the putrefaction was ſooner perceived in the phial that contained it, than in the other. This experiment was not repeated.

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this prejudice, that nothing was putrid but what was offenſively ſo; whereas, in fact, every fibre becoming more tender, and humour thinner, may in general be conſidered as advancing in corruption; whether that change tends to the better health or to the deſtruction of the perſon, or whether it becomes grateful or offenſive to the ſenſes.

§ See an Eſſay on the Cauſe of Animal Heat, inſerted in the Medical Eſſays, Vol. V. In this treatiſe the reader will find ſeveral curious obſervations relating to animal putrefaction.

‡ Vid. Nat. Hiſt. Cent. IV. Exper. 330.

In this manner the putrefaction of meat advances quicker in a confined than a free air; for, as the moſt putrid parts are alſo the moſt fugitive, they inceſſantly iſſue from a corruptible ſubſtance, and diſperſe with the wind: but, in a ſtagnation of air, they remain about the body, and by way of fermentation excite it to corruption||.

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|| *Corpus in putredine exiſtens, alii (corpori) a putredine libero facillimè corruptionem conciliat; quia illud ipſum (corpus) quod in motu inteſtino jam poſitum eſt, alterum quieſcens, ad talem motum tamen proclive, in eundem motum inteſtinum facile abripere poteſt.* STAHLII *Fundam. Chymiæ. Part.* II. *tract.* I. *ſect.* I. *cap.* v. In this light STAHL and other celebrated Chemiſts have conſidered a *putrid ferment*, and generally uſed the ſame expreſſion for it. BECCHER (*in Phyſic. Subterran. Lib.* I. *ſect.* v. *cap.* i. *n.* 34.) treating of a corroſive putrid ſubſtance taken in aliment, ſays of it: *Fermentum univerſo ſanguini imprimit.* And Mr. BOYLE has uſed the words *fermentation* and *putrefaction* of the blood promiſcuouſly, in his piece called Obſervations and Experiments on the human blood. But theſe authors are, nevertheleſs, very careful not to confound *putrefaction* with vegetable *fermentation*, accounting them only analogous proceſſes; and therefore uſe the ſame term to expreſs the putrefying and fermenting *agent*, from the want of more expreſſive words in the languages they wrote in. It were to be wiſhed, to avoid ambiguity, that we had two different words to denote the exciting cauſe of theſe two inteſtine motions: but this is the leſs to be expected, on account of the diſpoſition of all putrid animal ſubſtances to promote both animal putrefaction and a vinous fermentation in vegetables; as will appear by the ſequel of theſe experiments.

I have inſiſted the longer on this point, as I apprehended my frequent uſe of the term *ferment* in the preceding OBSERVATIONS, might induce ſome readers to think that I had endeavoured to revive the exploded doctrine of a fermentation of the blood, like that which takes place in the vegetable kingdom: than which nothing could be more contrary to my intention.

## EXPERIMENT XIX.

As for other ſeptics, recited by authors, I found none of them anſwer the purpoſe. The alcaline ſalts have been conſidered as the chief putrefiers: but this is diſproved by experiments. Of the volatiles it may, indeed, be obſerved, that tho' they preſerve from the common marks of putrefaction, with a force four times greater than that of ſea-ſalt; yet, in warm infuſions, a ſmall quantity of theſe ſalts will ſoften and relax the fibres, more than water does by itſelf. They alſo hinder the coagulation of blood; and when taken by way of medicine, perhaps thin and reſolve it, but are not therefore ſeptics. For, ſo little do theſe ſalts putrefy, or even reſolve the fibres, when applied dry, that I have kept ſince the beginning of June laſt (notwithſtanding the exceſſive heats,) a ſmall piece of fleſh in a phial, preſerved only with ſalt of hartſhorn, at preſent perfectly ſound, and firmer than when firſt ſalted *.

## EXPERIMENT XX.

FROM the ſpecimens we had of the antiſcorbutic plants, it is likewiſe probable none of that tribe will prove ſeptic. Horſe-raddiſh, one of the moſt acrid, is a very powerful antiſeptic. And tho' carrots, turnips, garlic, onions, celery, cabbage and colewort, were tried (as alcaleſcents) they did not haſten, but kept back the putrefaction.

## EXPERIMENT XXI.

THE caſe was different with ſuch farinaceous vegetables as were examined; *viz.* white bread in infuſion, decoctions of flour, barley and oatmeal; for, theſe did not at all retard putrefaction; but, after it was ſomewhat advanced, they checked it, by turning ſour. By a long digeſtion, the acidity became conſiderable; which by conquering the putreſcency of the fleſh, and generating much air, did not ill repreſent the ſtate of weak bowels, which convert bread and the mildeſt grains to ſuch an acid, as prevents a due *reſolution* and digeſtion of animal food *.

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* This piece is ſtill uncorrupted, tho' kept above a year and an half ſince the experiment was made.

## EXPERIMENT XXII.

I EXAMINED *cantharides*, dried vipers, and Ruſſian *caſtor*, all animal ſubſtances, and therefore moſt likely to prove ſeptic. The flies were tried both with freſh beef, and with the *ſerum* of human blood; the vipers with the former only; but neither of them haſtened putrefaction. And as for the *caſtor*, ſo far from promoting this proceſs, that an infuſion of 12 grains oppoſed it more than the ſtandard ſalt.

## EXPERIMENT XXIII.

AFTER finding no ſeptics where they were moſt expected, I diſcovered ſome which ſeemed the leaſt likely, *viz.* chalk, the *teſtacea*, and common ſalt.

Twenty grains of crabs-eyes prepared, were mixed with ſix drachms of ox's gall, and as much water; into another phial was put nothing but gall and water, in the ſame quantity with the former; and both being placed in the furnace, the putrefaction began much ſooner where the powder was, than in the other phial. I infuſed afterwards in the lamp-furnace 30 grains of prepared chalk, with the uſual quantity of fleſh and water; and obſerved, that the corruption not only began ſooner, but went higher by this mixture; nay, what had never hap-

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[*] It is to be remarked, that, in making this experiment, I did not then attend to a fermentation that enſued, and which was the cauſe of the acidity. This kind of fermentation between animal and vegetable ſubſtances, being hitherto overlooked, ſhall be therefore ſet forth in my next Paper.

happened before, that in a few days the fleſh reſolved into a perfect *mucus*. The experiment was repeated with the ſame effect; which being ſo extraordinary, I ſuſpected ſome corroſive ſubſtance had been mixed with the powder: but, for a trial, a lump of chalk being pounded, 30 grains of it proved fully as ſeptic as the former. The ſame powder was compared with an equal quantity of ſalt of wormwood, and care was taken to ſhake both the mixtures alike: but after three days warm digeſtion, the ſalt had neither tainted nor ſoftened the fleſh, whilſt the chalk had rotted and conſumed that which was joined to it. Nor were the effects leſs of the teſtaceous powders of the Diſpenſary. But egg-ſhells in water reſiſted putrefaction, and preſerved the meat longer than plain water*.

## EXPERIMENT XXIV.

To try whether the *teſtacea* would alſo diſſove vegetable ſubſtances, I infuſed them with barley and water, and compared this mixture with another of barley and water, without the *teſtacea*. After a long maceration by a fire, the plain water ſwelled the barley, became mucilaginous and ſour; but that with the powder kept the grain to its natural ſize, tho' it ſoftened it, yet made no mucilage, and remained ſweet.

## EXPERIMENT XXV.

Nothing could be more unexpected than to find ſea-ſalt a haſtener of putrefaction. But the fact is thus: One drachm of ſalt preſerves two drachms of freſh beef, in two ounces of water, above 30 hours, uncorrupted, in a heat equal to that of the human body; or, what amounts to the ſame, this quantity of ſalt keeps fleſh ſweet twenty hours longer than pure water; but half a drachm of ſalt does not preſerve it above two hours longer. This experiment has been already mentioned. Now I have ſince found, that 25 grains have little or no antiſeptic virtue; and that 10 or 15, or even 20 grains manifeſtly both haſten and heighten the corruption *. It is moreover to be remarked, that in warm infuſions with theſe ſmaller quantities, the ſalt, inſtead of hardening the fleſh, as it does in a dry form, in brine, or even in ſolutions, ſuch as our ſtandard, it here ſoftens and relaxes the texture of the meat, more than plain water; tho' much leſs than water with chalk or the teſtaceous powders.

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* The trial was made with a coarſe powder of this ſubſtance, but not repeated.

Many inferences might be made from this experiment; but I ſhall only mention one. Salt, the indiſpenſible ſeaſoner of animal food, has been ſuppoſed to act by an antiſeptic quality, correcting the too great tendency of meats to putrefaction. But, ſince it is never taken in aliment beyond the proportion of the corrupting quantities in our experiment, it would appear that ſalt is ſubſervient to digeſtion, chiefly by a ſeptic virtue; that is, by ſoftening and reſolving meats; an action very different from what is commonly believed §.

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* The moſt putrefying quantity of ſalt, with this proportion of fleſh and water, is about 10 grains.

§ We muſt except BECCHER, who not only mentions the reſolving quality of ſea-ſalt, but alſo its corroſive and putrefying nature, when taken too freely in aliment. *Vid. Phyſic. Subterran. Lib.* I. *ſect.* v. *cap.* i. *n.* 34.

It is to be obſerved, that all the above experiments were made with the white or boiled ſalt, kept for domeſtick uſes.

PAPER

# PAPER IV.

## *A Continuation of the Experiments upon* Septics; *with an Account of a Power diſcovered in putrid Animal Subſtances for exciting a vinous Fermentation in Vegetables; and of what uſe the* Saliva *is in this Proceſs* *.

IT being ſo eſtabliſhed an opinion, that ſalt reſiſts putrefaction with a power proportioned to its quantity, I did not therefore rely on my firſt trials, but repeated that experiment often which contradicted this maxim; and I ſtill found, that two drachms of freſh beef, with from five to twenty grains of ſea-ſalt, and two ounces of water, putrefied ſooner than the ſame quantity of fleſh infuſed in water only.

### EXPERIMENT XXVI.

1. I NEXT enquired if ſmall portions of other neutral or alcaline ſalts were in like manner ſeptic; but upon examining crude *ſal ammoniacum*, nitre, vitriolated tartar, *ſal diureticus*, as alſo ſalt of hartſhorn, and ſalt of wormwood, I could not perceive they were: tho' all of them in weak ſolutions were found to ſoften or reſolve the fleſh; ſalt of hartſhorn moſt, but nitre leaſt of any.

2. Neither does ſugar at all promote putrefaction. A plain ſyrup is ſaid to preſerve meat better than any brine; and from the trials I have made, this ſeems to be true: as alſo, that weak ſolutions of ſugar are proportionally antiſeptic. But, what is moſt remarkable here, tho' weak ſolutions ſoon yield to the putrefaction of fleſh, yet as ſoon as an acidity is produced from the ſugar's fermenting, that putrid tendency is either very much retarded, or entirely overcome. Wherefore, in ſugar the effects of both the *farinacea* and ſalts ſeem to be combined; for, as a ſalt, it oppoſes putrefaction at

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* Read at the R. S. April 25, 1751.

firſt, which the *farinacea* do not; and, like the *farinacea*, it checks putrefaction after the proceſs begins.

To this antiſeptic quality in ſugar, which in large quantities is daily joined to other aceſcent food, we may perhaps aſcribe ſome ſhare of the general decline of putrid diſeaſes. For, now we hear leſs often of leproſies †, hot ſcurvies, dyſenteries, plagues, peſtilential fevers, and the like diſtempers, formerly ſo frequent; and to which thoſe were peculiarly ſubject who uſed animal diet in exceſs, eſpecially ſalted meats. No doubt many other cauſes concur; but to enumerate them would be foreign to our preſent purpoſe, as well as to mention the inconveniences that may ariſe, on the other hand, from the immoderate uſe of ſuch things as too much oppoſe putrefaction.

3. I have alſo repeated the experiments with the *teſtacea*, and in particular on human blood, and found that crabs-eyes promoted the putrefaction of the *craſſamentum*, and likewiſe of the *ſerum*, but not ſo ſpeedily.

## EXPERIMENT XXVII.

1. HAVING a mind to ſee the action of the *teſtacea* combined with an antiſeptic, I infuſed half a drachm of the compound powder of contrayerva-root, with the uſual quantity of fleſh and water, and obſerved, that the teſtaceous part of this compoſition did ſenſibly weaken the vegetable, which is one of the ſtrongeſt antiſeptics. For, tho' upon the whole the powder did indeed reſiſt putrefaction, it was with much leſs efficacy than if the ſmall portion of the root, which enters the compoſition, had been uſed alone *.

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† Viz. the *Lepra Arabum*.

* The high opinion phyſicians of the laſt century entertained of the *teſtacea* and of their extenſive uſe, was founded on an *hypotheſis*, that moſt diſeaſes proceeded from an acid, not even excepting fevers. Now, tho' this theory is at preſent

2. To this examination of chalk and the *teſtacea* were added ſome experiments upon lime-water, made both of common lime and oyſter-ſhells; and I found that fleſh infuſed in either, immediately ſent forth a diſagreeable ſmell, as in a common lye; yet it did not become putrid till after the ſtandard: ſo that, in this trial, lime-water made ſome ſmall reſiſtance to putrefaction, tho' the materials, chalk and ſhells, are both ſeptics. Nevertheleſs, I have obſerved, that when the putrefaction began, it became always much more offenſive in this than in common water. And it will afterwards appear probable, that the virtues of this medicine do not conſiſt in correcting putrefaction; but, on the contrary, in checking immoderate acidities, the cauſe of many chronical diſorders.

Thus far have I related my experiments upon ſubſtances reſiſting and promoting putrefaction, by which it ſeems probable, that, of the former, there is an infinite

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ſent much limited, yet the practice is ſtill common, at leaſt in acute diſtempers; ſome uſing theſe powders from cuſtom chiefly, and others with a view to neutralize the acids then given, to fit them for entering the lacteals and promoting a *diaphoreſis*. Otherwiſe, it does not appear how theſe abſorbents ſhould correct any acrimony, either in the *primæ viæ*, or in the blood. But, whatever diſputes have ariſen about their manner of operating, almoſt all have agreed in believing them harmleſs: tho' partly from theſe experiments, and partly from practice, I have been led into another opinion. However, I would not from hence infer, that the *teſtacea* were only to be given when an acid was to be deſtroyed: ſince to cure ſome diſeaſes, it may be requiſite to attenuate the humours and relax the fibres by a degree of putrefaction. HIPPOCRATES obſerves, that a fever is the ſureſt remedy for ſome diſorders. The primary effects of mercurials conſiſt in a ſeptic *reſolution*, both of the fibres and humours. Poſſibly, therefore, the *criſis* of ſome fevers may be haſtened or perfected by the *teſtacea*, which we have ſhewn to be ſubſtances endowed with a conſiderable putrefying quality.

number; of the latter, few; tho' perhaps many more than we have yet diſcovered. In this laſt part I have confined my enquiries to ſuch things only, which induced putrefaction out of the body; for, as to mercury and certain poyſons, which taken into the ſtomach, or abſorbed by the veins, have the effect of ſeptics, I purpoſely omitted, as not being able to take in ſo large a field. But I ſhall add to what I have already laid before the Society, ſome other obſervations upon the corruption of animal ſubſtances, which have a very near relation to the former, and may not be without their uſe in medicine.

## EXPERIMENT XXVIII.

I MADE ſeveral mixtures, each conſiſting of two drachms of raw beef, as much bread, and an ounce of water: theſe being beat to the conſiſtence of a pap, were put into cloſe phials of three or four ounces meaſure, and placed in the uſual furnace; which in this, and in many of the ſubſequent experiments, was allowed to cool for ſome hours every night.

1. In a few hours all theſe mixtures began to ferment, and continued in that action about two days *. For the moſt part the fermentation was ſo ſtrong, that if the corks had not frequently given way, the phials muſt have burſt. The bread and fleſh, which at firſt lay at the bottom, ſoon roſe to the top, and conſtantly, as the air eſcaped, let fall ſome particles which had been bouyed up by it. Thus a ſediment was formed which reſembled lees, whilſt the lighteſt parts or flowers remained on the ſurface; but the fermentation continuing, theſe alſo ſubſided, and the acid taſte and ſmell of the liquors, after the action ceaſed, was a farther proof

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* I found afterwards, when the phials were left quite open, or ſo that the air could eaſily eſcape, that the fermentation was completed in leſs than half that time.

proof of the preceding fermentation. This change was the more extraordinary, that when the motion began, theſe mixtures were tending to corruption, and in effect in a few hours after became offenſive: but next day the putrid ſmell abated, and went quite off before the fermentation ended.

2. I repeated theſe experiments often, and with the ſame ſucceſs. And to be aſcertained of the part the animal ſubſtance had in producing ſuch effects, I made mixtures of bread and water only, which ſtood ſeveral days in the furnace, without any ſign of fermentation.

3. I added, to two drachms of freſh meat, a double quantity of bread, and water in proportion; and putting this mixture in the furnace, I obſerved the fermentation proceed as before, and with no other effect than that of producing a purer acid.

4. To the ſame quantity of fleſh and an ounce of water, was added only half a drachm of bread, but a fermentation nevertheleſs enſued, and the liquor became acid to the taſte, but with the ſmell of rank cheeſe.

5. Another variation was made with fleſh and oatmeal, inſtead of bread; but the effects were only different in a higher degree of fermentation, as the oatmeal had not undergone that proceſs before.

6. I tried if oatmeal and water would ferment alone, but tho' it did, the action was not near ſo ſtrong as when an animal ſubſtance was added.

7. Experiments were alſo made with bread and roaſted meat, with ſimilar effects; for, tho' the putrefaction was but juſt diſcernible, and the generation of air was much leſs than in the firſt experiment, yet the fermentation was compleat, and the mixtures became acid.

8. I varied the quantity, taking of roaſted meat and bread each an ounce, with about two ounces of water. This mixture being poured into a phial and corked, was left in a room with a fire; where the thermometer roſe no higher than about 65 degrees. Here the fermentation began late, and proceeded ſlowly: but, what was moſt remarkable, it no ſooner commenced than the

mixture, without ever becoming putrid, acquired a vinous ſmell, like that of other fermenting liquors: and towards the end, the uſual acid taſte and ſmell ſucceeded.

9. I mixed half an ounce of bread, with an ounce and a half of water, and a ſmall portion of the *craſſamentum* of human blood, already putrid; and ſetting this mixture in the furnace in a cloſe phial, I obſerved in it a very ſtrong fermentation ſome hours after.

10. I diſcovered the ſame quality in ſheep's gall. For, having put two drachms of bread, with half an ounce of this liquor, in a phial and placed it in the furnace, I perceived that mixture the next day generated air, as in the former experiments. The fermentation continued for two days, in which time the gall began to putrefy; but it recovered afterwards, ſo that on the ſixth day it ſeemed to be as uncorrupted as at the firſt; but without becoming acid.

From all theſe experiments it ſeems probable, that moſt animal ſubſtances tending to putrefaction, are endowed with a power of raiſing a fermentation in the *farinacea*; and even to renew that action in ſuch as have undergone it before.

11. After theſe mixtures become ſour, they never return to a putrid ſtate, but, on the contrary, grow more and more acid; and to ſuch a degree, that I compared one of them (which conſiſted of raw meat and bread, each two drachms, and an ounce of water) with a like mixture, to which was added in the beginning ten drops of the ſpirit of vitriol: and after both had ſtood ſome days in the furnace, I found the firſt apparently moſt acid. To account for this it will be proper to obſerve, that the addition of the ſpirit preventing fermentation, the laſt mixture had no more acidity than what was given to it by the vitriol.

12. I have alſo remarked, that the acid ariſing from theſe proceſſes, has ſomething of an auſtere and ſaltiſh taſte; but without any offenſive ſmell, unleſs the phials are kept cloſe during the fermentation, in which caſe the ſmell is like that of ſour milk or lean cheeſe.

Now, conſidering how much air is generated, and how ſour thoſe mixtures are made by fermentation, it may ſeem ſtrange, that the ſame materials uſed as food, ſhould make ſo little diſturbance in the body. And the difficulty would be the greater, did the *ſaliva*, as ſome ſuppoſe, promote both fermentation and putrefaction*.

## EXPERIMENT XXIX.

To aſcertain the effects of the *ſaliva* in digeſtion, I added a ſmall portion of it to ſome raw beef, and obſerved, that this mixture in the uſual heat putrified ſlower than another, which had no *ſaliva* joined to it.

## EXPERIMENT XXX.

1. I TOOK two drachms of freſh meat, the ſame quantity of bread and an ounce of water, and to theſe added as much *ſaliva* as I ſuppoſed neceſſary for digeſtion. This mixture, being beat in a mortar, was put into a cloſe phial, and ſet in the furnace, where it remained about two days with ſcarce any viſible fermentation; but on the third day this action became manifeſt. At that time I found the bread and fleſh riſen in the water, a ſediment forming, and bubbles of air continually mounting: in a word, that the fermentation

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* The *ſaliva* is reckoned by the celebrated STAHL among thoſe ſubſtances proper to excite a vegetable fermentation. *Vid. Fundam. Chym. Part.* II. *tract.* I. *ſect.* I. *cap.* v. And the ſame opinion has generally prevailed, as I imagine, from this circumſtance. A traveller gives an account of a ſtrange method of making a vinous liquor in uſe among one of the Indian nations. That is, by firſt chewing the fruit or grain before they put it to ferment. But all that can be inferred from hence, is that the *ſaliva*, without bringing on the fermentation ſooner, may make it more equable and moderate after it begins, (as in our experiments) which may be a neceſſary means of carrying on that proceſs in a hot climate.

was compleat, being alſo diſtinguiſhed by a vinous ſmell, as in ordinary working liquors. The action continued above twice as long as when no *ſaliva* was uſed, it was much more moderate, and generated air with little tumult. When the fermentation intirely ceaſed, the mixture had a pure acid taſte, but weaker than what was produced in the former experiments: and I took notice, that it was without any putrid ſmell from the beginning.

2. I likewiſe varied this experiment, as I had done the firſt, in uſing roaſted meat inſtead of raw, and ſometimes oatmeal in place of bread; but the reſult was ſtill the ſame. One circumſtance may deſerve particular notice. An ounce of bread, as much roaſted meat, about two ounces of water, and a ſmall quantity of the *ſaliva*, being beat together, were allowed to ferment in a heat of 65 degrees; and having examined the phial with a thermometer, I found it about three degrees warmer than the external air *.

From theſe laſt experiments it appears, that if the *ſaliva* is well prepared, is in a ſufficient quantity, and well mixed with the aliment, it is qualified for preventing putrefaction, immoderate fermentation, flatulence and acidity in the *primæ viæ*. But, if the ſame is deficient, unſound, or not well mixed with what is ſwallowed, that the aliment may firſt putrify, then grow acid, and in that action ferment ſtrongly, and generate much air in the ſtomach and bowels.

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* It is probable, that in a fermentation of this kind, the heat increaſes greatly in proportion to the quantity of the mixture. In ſo ſmall a quantity I doubt that neither vegetable nor animal ſubſtances, fermenting ſeparately, would raiſe any perceptible degree of heat: tho' vegetables alone are capable of acquiring an intenſe heat, (ſo indeed as to break out into a flame) if laid in a great heap, compreſſed and kept moiſt. But in this caſe, a putrefaction beginning, the fermentation is carried on between the ſeptic and the aceſcent parts, exactly as in the experiment above.

# PAPER V.

*Experiments and Obſervations on the Fermentation of Vegetables, by means of putrid Animal Subſtances; continued. Read at the R. S. June* 20, 1751.

IN my laſt Paper I gave an account of ſome obſervations made upon the fermentation of the *farinacea*, by means of animal ſubſtances; but not having then finiſhed the ſubject, I ſhall now lay before the Society ſome more of thoſe experiments.

## EXPERIMENT XXXI.

AFTER ſeeing the effects of the freſh *ſaliva*, both in keeping up and moderating fermentation, I wanted to know the qualities of the ſame when putrid. For this purpoſe, having collected a ſufficient quantity, I kept it about three days in the furnace *, and then added the uſual proportion of it to the common mixture of bread, fleſh and water; which, not only brought on the fermentation ſooner, but made it ſtronger and more productive of air, than would have happened without this addition. The fleſh became alſo more than uſually putrid; but was at laſt ſweetened by the acid, produced by the fermentation: ſo that, by the time that action ceaſed, the contents of the phial ſmelled and taſted ſour, without any remains of putrefaction.

From this experiment, we find it ſtill more probable, that animal ſubſtances have a power of exciting fermentation (in the *farinacea*) in proportion to their degree of corruption.

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* Viz. blood-warm, or about 100 degrees of FAHRENHEIT's thermometer: and the ſame degree of heat is to be underſtood as uſed in the reſt of the experiments, unleſs when it is expreſſed otherwiſe.

## Experiment XXXII.

I took two drachms of a freſh mackarel ſkinned, with an equal quantity of bread, and having reduced them to the uſual conſiſtence with an ounce of water, I put them in the furnace; together with another phial, containing the like mixture, but with the addition of the *ſaliva*; a third, with the ſame quantities of freſh beef, bread and water, with which the two former were to be compared. In leſs than five hours after infuſion, the materials in all the phials began to riſe, float in the water and ferment; and during the whole proceſs, I perceived no difference between the fermentation occaſioned by the fiſh, and that by the fleſh, except that the phials with the former retained the corrupted ſmell longeſt. But next day, the fermentation ſtill ſubſiſting, the acid ſmell was to be diſtinguiſhed in all the phials; and on the fourth day (the corks having been drawn the night before) I was ſcarce ſenſible of any difference between the firſt and the third or ſtandard phial, either as to taſte or ſmell; and both were very acid. But the liquor in the ſecond phial was not ſo ſour, and yielded ſuch a vinous ſmell as was taken notice of before, when the *ſaliva* was added to the common mixture with the beef.

Having therefore obſerved in this inſtance, ſuch an exact agreement between the effects of fiſh and of fleſh, in cauſing fermentation, and preſuming, that all fiſh was poſſeſſed more or leſs of the ſame quality, I did not repeat the experiment with any other ſort. For, tho' I was ſenſible, that for the better regulation of diet, and rightly underſtanding the different effects of different animals in food, it might be of uſe to analyſe in this manner many of the individuals, and to obſerve which of them were more or leſs apt to cauſe fermentation, and to produce more or leſs of an acid; yet, as thoſe diſquiſitions would have taken up too much time, I omitted them for the preſent, and purſued the general point of enquiring how extenſive this principle, of exciting fermentation, was among other animal ſubſtances.

## EXPERIMENT XXXIII.

I MADE, therefore, a trial with the yolks of new-laid eggs: One of which I mixed with two drachms of white bread and an ounce of water; and another, with the ſame proportion of bread and water, to which I added the *ſaliva*. But tho' both phials were kept four days in the furnace, I could perceive no marks of fermentation, or any tendency to putrefaction in either. Whereupon recollecting M. Rëaumur's obſervation about the ſlow putrefaction of unimpregnated eggs, I concluded, that either theſe two happened to be addle, and therefore reſiſted putrefaction ſo much the longer; or, what was moſt likely, that by a ſmall degree of acidity in the bread, they had been preſerved wholly from corrupting, and of courſe from fermenting too. So that this experiment ought to be no exception to the general obſervation, that all animal ſubſtances, upon putrefying, become ferments to the *farinacea.*

## EXPERIMENT XXXIV.

HAVING remarked, that the liquor reſulting from all the fermentations, had not only a ſour but an auſtere taſte; that I might be ſure this did not proceed from alum (which the bakers have been accuſed of mixing with their loaf-bread) I made a like trial of ſea-biſcuit; which yielded the ſame kind of an aſtringent acid as the other: and, as I remember, oatmeal afforded an acid little different from the reſt.

Hitherto we have ſeen how fermentable ſome of th *farinacea* are, by means of corrupted animal ſubſtances and how probable it is, that the reſt of that claſs of vegetables agree in that quality with the ſpecimens. I

ſhall

ſhall next relate my experiments upon vegetables of a different kind.

### EXPERIMENT XXXV.

In one phial I put two drachms of freſh beef, with a handful of new-cut ſpinage, and two ounces of water. In a ſecond, the ſame quantity of fleſh, half an ounce of boiled ſpinage, and between two and three ounces of water. In a third phial, was the ſame weight of the meat, with half an ounce of freſh aſparagus, and two ounces of water. In a fourth, was the like mixture, but with the aſparagus boiled. The fifth contained the ſame quantity of beef, with a handful of garden ſcurvy-graſs, and two ounces of water. The ſixth and laſt phial ſerved for a ſtandard, with the uſual mixture of beef, bread and water.

In leſs than five hours after ſetting them in the furnace, I found in a fermenting ſtate, not only the ſtandard, but the contents of the two phials with the aſparagus. The motion was particularly briſk in that with the raw plant; but in both, the fermentation went higher, and generated more air, than the ſtandard. In other reſpects the action was the ſame; for, the fleſh acquired at firſt a corrupted ſmell, but which it afterwards loſt; and next day, or about 30 hours after infuſion, the acid prevailed: which, tho' conſiderably leſs than that of the ſtandard, was yet ſufficient for curdling milk. But the great difference between the fermentation of the aſparagus and the bread, lay in this, that after the latter became ſour, it remained ſo; whereas the acidity in the aſparagus was ſo weak, that in two or three days after, it was entirely overcome by the corruption of the meat.

The proceſs with the ſpinage was little different, it fermented about an hour later than the ſtandard, and the raw plant ſomewhat later than the boiled. The fermentation of both was more moderate than either that of the aſparagus or bread, leſs air being generated, and that in a leſs tumultuous manner. At the ſame time the ſtandard became acid, this change was alſo diſtinguiſhable in the ſpinage, by the curdling of milk: but after this period, as was remarked of the aſparagus, theſe mixtures became likewiſe putrid.

The ſcurvy-graſs alſo fermented, and as early as the ſtandard, but more moderately and with leſs flatulence. Its acid was aſcertained by the ſame teſt with the former, viz. by curdling milk; but in this it differed, that after this change, it continued to preſerve the meat longer from corruption. By which it appears, that tho' this plant is without any manifeſt acid, it is, nevertheleſs, a pretty ſtrong reſiſter of putrefaction.

I took the more notice of the fermentation of the ſcurvy-graſs, as being of a claſs ſuppoſed unfermentable; and therefore I repeated the experiment, but with the ſame reſult. And ſince theſe trials agree with the conſtant obſervations of the virtues of this plant, in the marine and putrid ſcurvies, it may ſeem therefore improperly claſſed with ſuch medicines as correct acidities and promote putrefaction. As for the aſparagus and ſpinage, tho' they contain but a very weak acid, yet being fermentable, and in ſome degree reſiſters of putrefaction, neither can they be deemed ſeptics, but at moſt vegetables of eaſy corruption. The readineſs with which the aſparagus ferments, ſeems to correſpond with the quickneſs of its digeſtion in the ſtomach. For, from the experiments I have made, I am induced to think, that ſuch ſubſtances as are of the eaſieſt digeſtion, will fall into the ſpeedieſt fermentation in the furnace.

But excepting theſe mentioned, I have made trial of no other eſculent plants, ſince I diſcovered this their property of fermenting with corrupted fleſh. But I remember when, for ſome other intention, I had once made a mixture of fleſh, water and turnip, and ſet it in the furnace, without minding it for two or three days, that the liquor afterwards taſted ſour; which I preſume could not have happened without a previous fermentation. Hence, I conjecture, that all the alimentary plants, not over bitter, ſpicy or acid, will be found to ferment much in the ſame manner with thoſe mentioned: and I am almoſt confirmed in this opinion by the following experiment.

## EXPERIMENT XXXVI.

1. To an ounce of new milk were added ſome drops of the *craſſamentum* of human blood, reſolved by putrefaction; and the phial with the mixture being expoſed to the uſual heat, in a few hours the contents fermented. The inteſtine motion was conſiderable, a vaſt deal of air was ſeparated, and an acid produced, which curdled the milk and corrected the putrid ſmell.

2. The experiment was repeated with four ounces of milk, and about two drachms of the corrupted blood; and after ſix or ſeven hours quiet infuſion, a violent fermentation enſued; by which the glaſs ſtopper was thruſt out, and the froth came over, tho' the bottle was little more than half full. But, ſince milk may be conſidered as the juice of graſs and various other vegetables, not fully aſſimilated into an animal nature, we may judge from hence, how prone all vegetables are to ferment with any thing putrid.

Now, there being ſo near a conformity between the contents of the phials in moſt of theſe experiments and the aliment in digeſtion, it is ſcarce to be doubted, but that a fermentation is begun in the ſtomach as often as there is any animal ſubſtance to ſerve for a ferment, and vegetables to be fermented. That the aliment ferments in the ſtomach was an opinion of the Chemiſts; but as they did not explain the manner how, and applied the term fermentation to divers operations in nature, ſcarcely analogous to that proceſs, it was no wonder their theory was wholly rejected by ſome, and only admitted by others with many reſtrictions. Nor ſhall we infer from any experiment made, that this fermentation is either univerſal or indiſpenſible; ſince many live better on a vegetable than an animal diet. And tho' in ſuch caſes the vegetables may be ſaid to ferment with the *ſaliva*, it is plain that action muſt be inconſiderable, and come far ſhort of what reſults from a mixture of animal food. But, then we may obſerve, that without milk, vegetables alone afford but a poor and unwholeſome nouriſhment; and that ſuch as join milk to their vegetables, have in it an animal juice already half prepared. Again, that thoſe who require a vegetable diet moſt, are either hectic, or of a ſcorbutic habit; in which condition the *ſaliva* being in a putrid ſtate, may induce that change upon the aliment, which in better health would be effected by the corruption of meat in the ſtomach. For, without theſe circumſtances, a vegetable diet ſeems to ſuit thoſe beſt, who by great exerciſe or hard labour are able to ſubdue the viſcidity of unfermented chyle. This is the caſe of the common people in poorer countries, who ſubſiſt chiefly on the *farinacea* and eat no fleſh. But whenever ſuch, by age or infirmity, are laid aſide from work, they become very ſubject to indigeſtions; and, upon the whole, are leſs healthy and ſhorter lived, than thoſe that are nouriſhed on a mixture of animal and vegetable food.

It has been remarked, that the fermentation begins in the phials between four and five hours after infuſion; but this we are to underſtand of the manifeſt fermentation only: for, as to the inſenſible working of theſe mixtures, it muſt be allowed to begin much ſooner, and probably from the time they are firſt ſet in the furnace. Agreeably to which notion, we preſume, that after every meal, a fermentation is begun, and ſo far carried on in the *primæ viæ*, that before the chyle enters the lacteals, its particles become as diſunited, and the air as much looſened as in the phials, when the bread and fleſh firſt change their ſpecific gravity and float in the water. But, we do not pretend, that in a natural ſtate this fermentation comes ever to a vinous or an acetous height: being aſſured that the chyle is admitted into the blood, before it has undergone ſo conſiderable an alteration.

We have ſeen the uſe of the *ſaliva* in moderating fermentation, and making it very ſlow; as alſo in checking the two great propenſity of animal ſubſtances to putrefaction, and of vegetables to acidity. Now, when the *ſaliva* is ſound, and in ſufficient quantity, and the aliment well prepared and not too much of it, the fermentation paſſes without any tumult, and generates very little air. But in ſurfeits, or upon ſwallowing without due maſtication; when meats are eat tough and fat, or with farinaceous ſubſtances unfermented; or when by any accident the *ſaliva* is vitiated, too ſcanty, or not intimately mixed with the aliment, the fermentation becomes tumultous, the ſtomach ſwells with air, and this extraordinary commotion being attended with an unuſual heat, brings on that uneaſineſs called the heart-burn. And as in the experiments, a certain quantity of the *ſaliva* was found requiſite for keeping the fermentation within bounds, ſo we find in practice, that whatever promotes a greater ſecretion of that humour, or helps to mix it with our aliment, is the beſt remedy for ſuch indigeſtions.

If an oily ſubſtance is added to the common mixture, a ſtronger fermentation enſues, which cannot be moderated by the uſual proportion of *ſaliva*, till ſome fixed alcaline ſalt is added, as I found upon trial. And whereas I have alſo obſerved, that theſe ſalts will, without the *ſaliva*, not only ſuddenly ſtop very high fermentations in the phials, but likewiſe ſuppreſs them for ſome time, it is no wonder they ſhould be ſo ſure and ſpeedy a remedy in the heart-burn: ſince they not only render the *ſaliva* more ſaponaceous, but ſuſpend the fermentation, till more of that humour can be ſecreted and mixed with the aliment.

The theory reſulting from theſe experiments may help to account for ſeveral other ſtomachic diſorders; but I ſhall attempt to explain only one more at preſent. This is the *ſourneſs* of the ſtomach, occaſioned by a liquor ſo very acrid, as to excoriate the throat and ſet the teeth an edge. To learn the cauſe of this extraordinary acidity, I made various experiments upon our common food; and among others, I made ſeveral infuſions of bread in water in different proportions, which after keeping ſome days blood-warm in the furnace, became but very little acid, and ſtill leſs ſo when the *ſaliva* was added. And as for fleſh, ſo far is it from turning ſour, that its corruption ſeems directly oppoſed to acidity. Nevertheleſs it is certain, that many ſuffer greatly from an acid, tho' living on fleſh, bread and water only. Now, from the common notion about digeſtion, we ſhall hardly be able to account for this matter; but eaſily from the principle of fermentation. By which we find, that not only a ſtrong, but an auſtere acid may be produced from theſe very materials, as often as the ſtomach is relaxed, or any way diſabled from conveying the whole aliment into the inteſtines; for, what is left, having time to undergo a complete fermentation, will of courſe be changed into a harſh ſort of vinegar.

## PAPER VI.

*Experiments and Obſervations on Subſtances haſtening or retarding, encreaſing or diminiſhing alimentary Fermentation. Read at the R. S. Oct.* 31, 1751.

HAVING in the two preceding Papers laid before the Society ſome experiments, ſetting forth the general fermentation of alimentary vegetables, by means of animal ſubſtances tending to putrefaction, or already putrid; I ſhall now finiſh this part of my ſubject, by reciting ſome obſervations made upon bodies, that either haſten or retard, increaſe or diminiſh this proceſs. And I ſhall endeavour, as before, to apply theſe experiments to uſe.

## Experiment XXXVII.

1. To two drachms of freſh beef, and as much bread, were added red port and water, of each half an ounce. To the ſame quantity of bread and fleſh, in another phial, was put an ounce of common ſmall beer. In a third phial the bread and fleſh were diluted with an ounce of water, acidulated with a few drops of the ſpirit of vitriol. And in a fourth phial were the ſame materials, only inſtead of the ſpirit I put two drachms of the acid liquor ariſing from a fermentation of bread, fleſh and water. All theſe mixtures being reduced to the uſual conſiſtence, were ſet in the furnace, where they remained three days, without generating air, or affording any ſigns of fermentation. But, two tea ſpoonfuls of rum being added to the common mixture, only retarded fermentation for ſome hours; tho' probably a double or triple quantity had wholly ſuppreſt it.

2. In one of the common mixtures were infuſed five grains of the *ſpecies aromaticæ*. In another, ten grains of cummin ſeed. A third had half a drachm of ſaſſafras. A fourth, five grains of ſaffron. A fifth, five grains of myrrh. And a ſixth, five grains of aloes. In the laſt two the ſubſtances were diſſolved; but in all the reſt, the infuſions were made in boiling water, and when cool, added to the bread and fleſh, together with the ſeveral ſubſtances infuſed. Beſides theſe, another phial with the common mixture was prepared for a ſtandard, with which the reſt were to be compared, in relation to their manner, time and degree of fermenting. Things being thus diſpoſed, and the phials placed in the furnace, I obſerved the fermentation began in them all much later than in the ſtandard, that with the ſaſſafras excepted; but with this difference among them, that the mixtures with the aromatics, eſpecially that with the ſaſſafras, fermented ſtrongly and generated more air than the ſtandard; whilſt thoſe with the ſaffron, myrrh, and aloes fermented ſlower, and were leſs flatulent.

3. In the ſame manner, I examined wormwood, leſſer centaury, chamemile-flowers, gentian root and green tea; making moderate infuſions of all except of the laſt, which was ſtrong; and I perceived, that theſe alſo retarded fermentation conſiderably; the chamemile and wormwood moſt. And that all of them, like the former bitters, moderated the fermentation, tho' none of them nearly ſo much as the *ſaliva*.

4. I found the ſame effect in ſtrained decoctions of the valerian-root and Peruvian Bark. But when the decoction of the laſt was left unſtrained, the fermentation became conſiderably greater than in the ſtandard. Whereupon, recollecting the like high fermentation of the ſaſſafras, and what is ſaid of the fermentation of Thames water in oaken caſks*, I aſcribed theſe greater commotions to the aptneſs wood has to increaſe fermentation, when infuſed with any thing putrid. But, however that be, it is likely that this fermenting quality of the Bark may be the cauſe of its diſagreeing with weak ſtomachs, when taken in ſubſtance and in large doſes.

5. In like manner, I examined horſe-radiſh, muſtard-ſeed and garden ſcurvy-graſs, as ſpecimens of the hot alcaleſcent plants, and obſerved, that the firſt, like the bitters, ſuſpended the fermentation long, the muſtard a little while, but the ſcurvy-graſs not at all. And I took notice, that theſe mixtures not only fermented more moderately than the ſtandard, but than

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* The great diſpoſition in the Thames water to ferment and putrify in long voyages, is well known; and it is probable, that this quality is owing to the extraordinary quantity of putrid matter, with which it is impregnated, at the place it is taken up by the ſailors, *viz.* a little below London bridge. As I have never heard of this or any other water fermenting, but in wooden veſſels, we may conclude that a vegetable juice is a neceſſary ingredient. Oaken caſks are peculiarly noted for promoting the fermentation of common vinous liquors.

any of the ſubſtances above mentioned; and therein approached nearer to the nature of the *ſaliva* than any thing yet tried. Laſtly, I obſerved both of the bitter and acrid plants, that after a compleat fermentation, the acid produced ſeemed a good deal milder than that in the ſtandard.

From theſe experiments it ſeems evident, that ſpirits, acids, bitters, aromatics and the hotter antiſcorbutic plants retard fermentation by their power of correcting putrefaction; and ſince putrefaction and fermentation are ſuch requiſites in digeſtion, that every thing oppoſing them muſt be contrary to it. But whereas, by means either of a putrid *ſaliva*, or a defect of it, the aliment may ferment too violently; or by a debility of the ſtomach the food may be detained too long in it, and ferment too much, acids, bitters, aromatics, wines, *&c.* may have their ſeveral uſes; ſome for checking immoderate fermentations, and others for bracing the ſtomach, and fitting it for expelling its contents in due time.

Fermentation being wholly ſuppreſt in the phials by ſmall beer, wine, and acids, may ſeem to argue as if this proceſs would not take place in the ſtomach, during the free uſe of ſuch liquors. But, to this we muſt obſerve, that the experiments mentioned were made without any *ſaliva*; for when new trials were made with a ſufficient quantity of it, the ſame materials then fermented well, and only ſomewhat later than in the ſtandard. Again, when the putrid *ſaliva* was uſed, ſo far were the acids from being of diſſervice, that they were highly uſeful, in preventing the more violent fermentations that ſuch mixtures would have produced. But, whenever the recent *ſaliva* was overpowered by the acid, the fermentation was then to be promoted by correcting that acid, by means of an alcaline ſalt, or the teſtaceous powders.

All theſe facts correſpond with digeſtion. For the moſt nouriſhing and digeſtable food to people in health, conſiſts in a due mixture of animal and vegetable ſubſtances,

ſtances, with water. Scorbutic or putrid habits require acids, wine or other antiſeptics. An acid abounding in the ſtomach is corrected by abſorbents; and in a want of natural heat, and a debility of the ſtomach, wines, bitters, warm and acrid ſubſtances become neceſſary, for bracing and ſtimulating the fibres.

Since one great uſe of the *ſaliva* is to moderate fermentation, it is probable, that ſuch ſubſtances as reſemble it moſt in this quality, will prove the beſt ſtomachics, whenever that humour fails. Of this claſs are acids, ſpirits and bitters; but, as all theſe very much retard as well as moderate fermentation, they may be frequently leſs proper than ſome of the warmer antiſcorbutics, which, as we obſerved before, both retard fermentation, and keep it moſt within bounds. And, as to the aromatics, however aſſiſting they may be in digeſtion, by their heat and *ſtimulus*, they promiſe leſs of a carminative quality than either the bitters or antiſcorbutics; in as much as they are more diſpoſed to encreaſe than to moderate fermentation, and conſequently to produce air inſtead of ſuppreſſing it.

## EXPERIMENT XXXVII.

BEING deſirous of comparing the effects of bile with thoſe of the bitter plants, I made trials with freſh ſheep's gall; but found the reſult very different from the common opinion of the agreement between an animal and vegetable bitter. For, having added a portion of this gall to fleſh, bread and water, and made a ſtandard of a like mixture, without the gall, I perceived the fermentation begin in both about the ſame time, but to be much ſtronger and more tumultuous in the firſt than the laſt phial. Nay, ſo little was the gall diſpoſed to reſtrain fermentation, that without any other animal ſubſtance, it fermented with bread and water only, as was mentioned in a former Paper. Now, ſince vegetable bitters are antiſeptic, retarders and moderators of fermentation, they muſt therefore influence digeſtion very differently from the bile, which is poſſeſſed of all the oppoſite qualities. This being the caſe, we cannot be ſurprized at finding digeſtion ſo little mended in the jaundice by the bitters, commonly given to ſupply the defect of the bile. There is nevertheleſs one quality in which the animal and vegetable bitters may agree, *viz.* in correcting acidity: for, I took notice, that tho' the bilious mixtures loſt the uſual rankneſs, acquired in the beginning of a fermentation, yet they never ſmelled or taſted ſour after the fermentation ended.

## EXPERIMENT XXXIX.

UPON adding ſea-ſalt to the common mixture, I obſerved, that what was the ſeptic quantity of it in the former experiments, the ſame made the fermentation begin ſooner than in the ſtandard; but that a larger quantity retarded it. Thus, two drachms of bread, with as much water, and ten grains of ſea-ſalt, fermented ſomewhat ſooner than a like mixture without ſalt: but when the ſalt was increaſed to half a drachm, the fermentation came on later than uſual.

But ſalt of wormwood and lye of tartar always retarded fermentation, and that in proportion to their quantity. I tried no other ſalt, being perſuaded that all the reſt would reſiſt fermentation, in any proportion, as being all thoroughly antiſeptic.

## EXPERIMENT XL.

A FEW grains of prepared crabs-eyes, added to the common mixture, brought on the fermentation above half an hour before the ſtandard, and made it much greater. The meat alſo became ranker than uſual, but was at laſt ſweetened by the acid produced in this proceſs. But when twenty or thirty grains of this powder were uſed, the fermentation came on ſtill earlier, and was more violent; and the fleſh becoming once putrid, never recovered.

The effects of lime-water were different, as it neither haſtened the fermentation, nor made it ſo ſtrong as above; the motion however was briſk, and when it ceaſed, a liquor reſulted neither acid nor putrid, but of an agreeable ſmell, like that of new bread.

Thus the *teſtacea*, lime-water and fixed alcaline ſalts agree in ſome things, particularly in ſubduing acids, but differ in others. For, both putrefaction and fermentation are reſiſted by the ſalts, but promoted by the *teſtacea*. Lime-water neither retards fermentation, like the lixivial ſalts, nor haſtens it, nor makes it ſo violent as do the *teſtacea*; and being beſides of an aſtringent nature, it becomes an excellent medicine for ſuch as have weak ſtomachs, with a predominating acid; as many have experienced, that were ſubject to the gout, gravel, or other chronic diſeaſes that ſeemed depending on that cauſe.

## EXPERIMENT XLI.

ALIMENTARY animal ſubſtances, tending to putrefaction are the only remaining promoters of fermentation, ſo far as I have enquired. Meat, when tender, tho' yet ſweet, becomes a readier ferment than the ſame kind eaten quite freſh. But, tho' the fermentation is by this means ſooner induced, it is not made thereby the ſtronger. Fleſh pounded in a mortar ferments much ſooner, and with leſs tumult, than the ſame does in a lump, or not ſufficiently bruiſed; and raw meat ferments more violently than roaſted. All which are circumſtances very conſonant to common obſervation, how much better meats are digeſted when kept till they are tender, well dreſs'd, and ſufficiently chewed: and ſeem to prove, that whatever is ſlow to corrupt, will alſo feel heavy on the ſtomach.

Eggs are among the leaſt corruptible of animal ſubſtances, and of courſe among the ſloweſt to excite fermentation. Hence a new-laid egg, for its bulk, ſhould be of all tender animal food the heavieſt; which yet by another theory, regarding the nutrition of the chick only, has been thought the lighteſt.

## PAPER VII.

### *Experiments and Obſervations upon the Putrefaction of the blood, and of other animal Subſtances. Read at the R. S. Feb.* 13, 1752.

HAVING in my laſt Paper finiſhed that part of my ſubject which related to the vinous fermentation of vegetables, excited by a putrid ferment, I ſhall conclude the whole with ſubjoining a few experiments made upon the putrefaction both of blood, and of the more ſolid parts of the body, with a view to clear up ſome other points in the theory of medicine.

### EXPERIMENT XLII.

A PORTION of blood, taken from a man ill of a pleuriſy was divided into the tough inflammatory cruſt, the *craſſamentum* and the *ſerum.* Theſe were put into different phials of a larger ſize (ſo as to contain a good deal of air) and being corked, were placed in the furnace, heated to the common ſtandard of 100 degrees of Fahrenheit's thermometer. In twelve or fourteen hours, the cruſt began to corrupt; the *craſſamentum* held out a few hours longer: but the *ſerum* continued near four times longer than this laſt, without any offenſive mark of putrefaction. This experiment was repeated with ſome freſh pleuritic blood, taken from another perſon, and with the like ſucceſs.

2. Another time, having procured blood with a thick inflammatory cruſt, I ſeparated that part of it from the reſt, and dividing it into two, I expoſed one piece to the air in a room, and the other I kept in a ſaucer

and covered it with a cup. The experiment was made in ſummer, and I obſerved, that the former piece (which at firſt had weighed two drachms) loſt half of its weight in 24 hours, by evaporation only; and that in two days more, the whole was reduced to a thin pellicle; but that the covered portion, in a few days, run *per deliquium*: whilſt one part of the *craſſamentum*, that had likewiſe been left to evaporate (upon the outſide of a window) formed into a thick cake; and the reſt of that ſubſtance, which was kept in a cloſe phial, retained a good degree of coheſion for ſome weeks after.

This inflammatory cruſt being therefore ſo ſoluble, volatile and corruptible, we may conclude, that it contains a greater quantity of ſeptic particles than any other part of the blood. How this comes to paſs, I ſhall now endeavour to explain.

Whether thoſe kinds of inflammatory fevers are firſt brought on by the ſhutting up of the pores, or from ſome other caſe, has been a queſtion; tho' it has never been doubted, but that a ſtoppage of perſpiration is, at leaſt, the conſequence of ſuch fevers. And therefore it follows, that in either caſe, the moſt corrupted particles muſt be retained at a time when, from a greater degree of heat, the humours are moſt diſpoſed to putrefaction. But, whenever, upon bleeding, the blood is allowed to ſtand till the homogeneous parts have time to unite, the perſpirable and ſeptic matter immediately flies off from the *ſerum*, as leaſt viſcous, but adheres to the *craſſamentum*; and is ſtill more entangled in the ſizy or glutinous portion of the blood, that riſes to the ſurface.

I muſt add, that tho' the texture of bodies is uſually looſer in proportion to the quantity of putrid matter which they contain; yet, in this caſe it is probable, that both the colour and great tenacity of this cruſt is, in a good meaſure, owing to theſe very particles; ſince all inflammatory blood, either dropping from the vein, or ſtirred about before it cools*, or even when received into a very flat veſſel, affords little or none of this cruſt [§]. For, in all theſe circumſtances, a large ſurface of the blood, whilſt warm, being expoſed to the air, the more fugitive parts of it find means to evaporate before any part of the maſs is congealed.

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* SYDENHAM cap. de Pleurit.

## EXPERIMENT XLIII.

MINERAL acids being ſuch powerful antiſeptics, I was deſirous to ſee their effects upon ſubſtances already putrid. For this purpoſe, I dropped ſpirit of vitriol both upon a ſmall piece of corrupted beef, and upon the *craſſamentum* of human blood, in the ſame ſtate; and obſerved, that this acid, inſtead of allaying the *fœtor*, rather increaſed it; tho' by this means, it was changed into ſuch as ariſes during the precipitation of brimſtone (by an acid) in a lixivial *menſtruum* [*].

Having repeated the experiment both with the ſpirit of ſea-ſalt and with vinegar, with the ſame reſult, we may from thence conclude, that the *effluvia* iſſuing from corrupted ſubſtances chiefly conſiſt of the *phlogiſton* [‖], or *ſulphur-principle*; ſince theſe *effluvia* ſo readily unite with and volatilize the acids; as appears by the increaſe and particular change of the ſmell. But, it will be proper to remark, that from a ſimple putrid ſubſtance, the *phlogiſton* does not riſe alone, but combined with the ſaline parts of the body. For, this principle, when ſingle, is perhaps imperceptible to the ſmell, and when diveſted of theſe ſalts, is never, ſo far as we know, peſtilential. So that the deleterious particles of rotten ſubſtances ſeem to conſiſt in a certain combination of the *ſulphurous* with the *ſaline* principle, which not only become the moſt irritating *ſtimuli* to the nerves, but act upon the humours as a putrid ferment in promoting their corruption.

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[§] TH. SCHWENCKE Hæmatolog. cap. xvi. v.

[*] Sciendum vero ſulphur ſolutum alcalicis, dein miſto acido præcipitari, albeſcere, *fœtorem ingratiſſimum putrefactorum excrementorum* exhibere.—Si tincturæ aureæ ſulphuris acetum inſtillas, mox *fœtor* prodit *ſtercoreus* ex præcipitato ſulphure. BOERHAAVE, *Element. Chem. Tom.* II. *Proc.* CLIX.

[‖] Materiam et principium ignis, non ipſum ignem, ego *phlogiſton* appellare cœpi; nempe primum igneſcibile, inflammabile, directe atque eminenter ad calorem ſuſcipiendum atque fovendum habile principium. STAHLII *Fundam. Theor.* BECCHERIAN.

From the ſame experiment it likewiſe appears, that the *fæces humanæ*, to which this mixture (made between a putrid ſubſtance and an acid) has a near affinity, muſt be compounded of ſome ſtrong acid and a corrupted matter; and from thence, that, in a natural ſtate, the *fæces* are ſo little infectious: which could not happen were they wholly ſeptic *.

## EXPERIMENT XLIV.

AFTER the acid was added, in the manner deſcribed in the laſt experiment, I attempted to reſtore thoſe ſubſtances to their former putrid ſtate, by adding an alcaline ſalt. But, upon inſtilling the lye of *tartar* (which was followed with the uſual effervеſcence) I perceived, that the mixture became thereby conſiderably leſs offenſive: a circumſtance I no ways expected. But from hence we may, perhaps, be able to account for the virtues of the ſaline draughts of Riverius, taken in the act of effervеſcence, and ſtrongly recommended by that author, in vomitings incident to putrid and malignant fevers §.

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* See the preceding OBSERVATIONS, Part III. ch. viii. ſect. vi. p. 353.

§ Vid. RIVER. cap. de Feb. Peſtilent.

## EXPERIMENT XLV.

IN order to examine the colour of the different parts of the blood corrupted, I procured a freſh quantity without any inflammatory cruſt, and divided it into the *craſſamentum*; the *ſerum*, with a few red globules, that fell to the bottom; and the pure *ſerum*. The phials containing theſe ſeveral liquors were ſet in the furnace, where they ſtood ſome days, till they became thoroughly putrid.

1. The *craſſamentum* changed from a deep crimſon to a dark livid colour: ſo that when any portion of this was diluted with water, it appeared of a tawny hue. Of the ſame colour was that *ſerum* in which the red globules had been diſſolved. But, the pure *ſerum*, after becoming turbid, dropt a white purulent ſediment, and changed into a faint olive-green.

From this experiment we may learn, that the *ichor* of ſores, and of dyſenteric fluxes, conſiſts of the *ſerum* tinged with a ſmall quantity of red blood putrefied; and that when the ſerous veſſels are of a tawny caſt, we are not always to refer that colour to inflammation, but to the ſolution of ſome of the red globules mixed with the *ſerum*. An inſtance of which may be ſeen in the colour of the *white* of the eye in deep ſcurvies, and in the advanced ſtate of malignant fevers. At ſuch times, not only the *ſerum* of the blood drawn from a vein, and what oozes from a bliſter, but even the *ſaliva* and ſweat will be tinged in the like manner §.

2. To the recent urine, of a perſon in health, were added a few drops of this putrid *craſſamentum*, which it immediately changed into a flame-coloured water, ſo common in fevers and in the ſcurvy. After ſtanding an hour or two, the ſame gathered a cloud, reſembling

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§ See the preceding OBSERVATIONS, Part III. ch. iv. ſect. iv. p. 236, 237.

what is ſeen in the crude water of acute diſtempers: and I took notice of a ſpeck or two of an oily ſubſtance, on the ſurface, like that ſcum which floats on ſcorbutic urine.

As to a green *ſerum*, it is perhaps never to be ſeen in the veſſels of a living body; ſince, in all putrid diſtempers, the red globules, being firſt reſolved, enter the ſerous veſſels; and when the *ſerum* is thus coloured, it never can become green. Beſides, as this humour is very late in acquiring that caſt, when out of the body, it is not to be ſuppoſed that a perſon could ſurvive ſo putrid a ſtate of the blood. But, in dead bodies, this *ſerum* is to be diſtinguiſhed by the greenneſs the fleſh acquires in corrupting. In ſalted meats, this is commonly aſcribed to the brine, but erroneouſly; for, that has no power of giving this colour, but only of qualifying the taſte, and in ſome degree, the bad effects of corrupted aliments. This greenneſs, in dead bodies, is ſooneſt ſeen in the parts adjoining to the *colon*; which receive the firſt taint from the incloſed *fæces*.

In foul ulcers and in other ſores, where the *ſerum* is left to ſtagnate long, the matter is likewiſe found of this colour, and it is then always acrimonious. But, the effects of a green *ſerum* are no where ſo much to be dreaded as in the caſe of an *aſcites*, where it is collected in ſo large a quantity. Of which we had, ſome time ſince, almoſt a fatal inſtance in Mr. Cox, ſurgeon at Peterborough, who upon tapping a woman but a few hours after death, was ſo affected with the poiſonous ſteams of a green *ſerum*, that he was preſently ſeized with a peſtilential fever, and narrowly eſcaped with his life *.

I have already obſerved, that the *ſerum* of human blood, upon ſtanding but a little time in the furnace (long before it grows offenſive) becomes turbid, and gradually drops a ſediment reſembling well digeſted matter. This experiment was alſo frequently repeated with the ſame ſucceſs; and I likewiſe took notice, that this ſubſtance never changed its colour, or mixed again with the *ſerum* From all which circumſtances, I conjecture, that it is a terreſtrial matter, intended for the nouriſhment or reparation of the ſolids. And I was the more confirmed in this opinion, upon diſcovering a like ſediment in the urine of men in perfect health after long ſtanding; conſidering this laſt as the redundance of the former, or what had been actually applied, but then ceaſed to be of any longer uſe.

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* Philoſ. Tranſact. abrid. Vol. IX. Part III. ch. v, art. viii.

We may therefore conclude, that the *ſerum* is perpetually oozing into all ulcers; but, that from the heat of the part, and the natural volatility of animal fluids, it is all quickly evaporated, excepting this ſediment, which remains in the ſore in the form of *pus* or digeſted matter, ſo requiſite for the cure. For this reaſon, all large ulcers are extremely weakening, from the great expence of blood in furniſhing this ſubſtance: and hence it is, that iſſues are of more conſequence for making drains, than one would expect from the viſible evacuation. As near as I could gueſs, an ounce of *ſerum*, upon ſtanding ſome days, did not furniſh more of this *matter*, than what might be produced in the daily diſcharge of a large pea-iſſue, or from a ſeton.

## EXPERIMENT XLVI.

As all the humours become thinner by putrefaction, ſo the ſolid or fibrous parts of animal bodies are relaxed or rendered more tender by the ſame proceſs. This obſervation is ſo common and uncontroverted, that it requires no new experiments to confirm it. I ſhall therefore only remark, that this ſtate ſeems to be the cleareſt caſe of diſeaſes depending on weak and lax fibres; as it appears in all malignant fevers, and in the true *ſea* and marſh-ſcurvies.

From this circumſtance we are enabled to account for the extraordinary bulk of the heart, liver and ſpleen incident to theſe diſeaſes. For, if we ſuppoſe the natural growth ſtopped by the rigidity of the fibres, ballancing the diſtending force of the blood, it will follow, that whenever the fibres are præternaturally ſoftned, the increaſe of theſe parts will begin a-new *. Of this fact we have ſtrong inſtances in the caſe of thoſe who died of the laſt plague at Marſeilles, communicated to this Society by M. Deidier, one of the phyſicians to the King of France §; and which, with others of the ſame ſort, have been ſince republiſhed in a large collection of papers relating to that fatal diſtemper ‡. It is remarkable, that in theſe nine diſſections referred to, the extraordinary growth of the heart is mentioned in them all, and of the liver in ſeven of them. Thus, in the firſt, the author obſerves, that the heart was of an extraordinary bigneſs, and that the liver was of double the natural ſize.—Caſe 2. The heart was of a prodigious bigneſs, the liver much enlarged.—Caſe 3. The heart of double the natural bigneſs.—Caſe 4. The heart was very large, and the liver was bigger and harder than ordinary.—Caſe 5. We found the heart of a prodigious bigneſs —Caſe 6. The heart was larger than in its natural ſtate: the liver alſo was very large.—Caſe 7. The heart was of a prodigious ſize, and the liver was very large.—Caſe 8. We found the heart much larger than natural, and the liver of a prodigious ſize.—Caſe 9 The heart was double the natural bigneſs, and the liver alſo was larger than ordinary.

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* This ſuppoſition from my ingenious friend Dr. Simson, Profeſſor of Medicine in the Univerſity of St. Andrews.

§ Phil. Tranſact. abrid. Vol. VI. Part. III. ch. ii.

‡ Traité de la Peſte, Partie I.

As to the ſcurvy, Eugalenus, a celebrated author on that ſubject, takes notice, that the liver and ſpleen were often ſo much enlarged that the tumour could be ſeen outwardly *. To theſe inſtances I ſhall add, from my own obſervation, the extraordinary thickneſs of the coats of the *colon* in the dyſentery, proceeding, as I imagine, from a like cauſe §.

Of all the fibrous parts of the body, the *colon* and *rectum* ſeem to corrupt ſooneſt after death; which may be eaſily accounted for from the nature of their contents. Next to theſe, (as I have been informed by a perſon who has made an uncommon number of diſſections) the lungs are the ſooneſt tainted in dead bodies; whether from the air ſtagnating in the *veſiculæ bronchiales*, or from ſome remains of the perſpirable matter, that may act as a ferment and haſten the putrefaction. The ſame gentleman acquainted me, that the brain was found to be very variable in this reſpect; for, that ſometimes it corrupted ſpeedily, and at other times, that it might be kept ſweet as long as any other part of the body. This laſt circumſtance would have been the more curious, could the diſſector have had an opportunity of knowing the diſtempers of which thoſe people died.

The marrow is commonly accounted a ſubſtance the moſt offenſive when corrupted; perhaps from this reaſon only, that carious bones are more offenſive than other ſores. But, however that be, I am apt to think, from the following experiment, that the marrow, in general, putrefies very ſlowly.

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* Lib. de Morbo Scorbuto, art. xxxi.

Conf. MEAD, Mon. & præc. Med. c. xvi.

§ See the preceding OBSERVATIONS, Part III. ch. vi. ſect. ii.

## EXPERIMENT XLVII.

I put an equal, but a ſmall quantity of ox's marrow into two large phials, to one of which I added prepared crabs-eyes. Theſe being corked, were ſet by a fire (kept in all day) in a heat ſufficient for liquefying the marrow, that is, much above the hundred degree of Fahrenheit's ſcale; and there they continued near five weeks. Yet, at the end of this time, I could perceive nothing offenſive in the phial with the pure marrow, and the other ſmelled only a little rancid.

From this experiment, I ſhould alſo doubt that the *fœtor* of a carious bone was not to be imputed to the marrow; ſince the corruption of that ſubſtance tends more to the rancid than to the cadaverous kind. And, therefore, I am induced to refer that *fœtor* to one of the three following cauſes, if not to a combination of them all. The firſt, may be the porouſneſs of the bone, which retains the corrupted matter longer than any ordinary ſore. The ſecond, the more conſtant oozing of veſſels conveying the red blood; for, when theſe are broken in a bony ſubſtance, they contract not ſo ſoon as in a common ulcer: and we have ſeen, that the red part of the blood admits of a higher degree of corruption than the ſerous. The laſt, the oſſeous matter crumbled to powder, and which being an abſorbent *earth*, may act here like chalk or the *teſtacea*, and ſo heighten the putrefaction.

Having once more mentioned the ſeptic ſubſtances, I ſhall take this opportunity of offering a conjecture about their manner of operating. That there is a latent acid in the compoſition of all animal bodies, is ſcarce to be queſtioned, altho' it may be hard or even impoſſible to produce it in a ſimple form. Now, this acid, I conceive to be one of the chief ingredients in the cement between the particles that conſtitute a fibre; and that chalk and the *teſtacea* act as diſſolvents, by being the proper abſorbents of it.

And, as for ſea-ſalt, which is likewiſe endowed with a ſeptic power, tho' conſiderably weaker than the former, I likewiſe impute it to the abſorbent part, after the acid is ſeparated. For, there is reaſon to believe, that animal ſubſtances beginning to corrupt, do looſen the texture of the ſalt; whereupon the acid ſpirit evaporates, and leaves the abſorbent ſubſtance behind: and this, from experiments I have made, I am inclined to believe is of a teſtaceous nature *.

## EXPERIMENT XLVIII.

1. It is well known, that fleſh, as well as blood, is ſpecifically heavier than water; and that dead bodies float, after lying ſome time at the bottom, from air generated in the bowels by putrefaction. But, I have obſerved, that a bit of meat beat in the mortar to the conſiſtence of a pap, put into a phial with water and ſet in the furnace, (as in the foregoing experiments) after remaining a few hours at the bottom, floated before it turned any ways offenſive: tho' after it roſe, the corruption ſoon became perceptible. Here it is probable, that the particles of air, incorporated with the animal ſubſtance, † begin to be diſengaged, and ſo collected together as to buoy up the fleſh; tho' at this time there are ſcarce any air-bubbles to be ſeen adhering to it.

2. Farther, I have remarked, that both the *craſſamentum* and *ſerum* of human blood have yielded air (after ſtanding ſome time in the lamp-furnace) before any offenſive degree of putrefaction was perceived. This was eaſily diſcerned by the accumulation of the

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* Tho' a large quantity of crabs-eyes was diſſolved in the ſpirit of ſea ſalt, yet the liquor remained clear; and when fully ſaturated, and diluted with common water, had exactly the taſte of ſea-water. This experiment was often repeated.

† Dr. HALES's Veget. Stat. Ch. vi.

air in the phials: for, in that heat, the included air, where there is no animal ſubſtance, acquires no perceptible elaſticity.

3. But, upon the thorough putrefaction of all animal ſubſtances, a conſiderable quantity of air is generated; which being a fact ſufficiently known, I ſhall only add, that I have conſtantly obſerved that a great deal more air is produced from fleſh than from blood, which is likewiſe agreeable to the general experiments of the excellent Dr. Hales *.

Now, as I could be aſſured, that the blood and other animal ſubſtances, at the time they began to emit air, were not ſo far advanced in the ſeptic proceſs, as the ſame are often found in ſome putrid diſeaſes, I was induced to think, that poſſibly ſeveral ſymptoms in deep ſcurvies might be owing to the action of the air (within the veſſels) either wholly detached from, or but imperfectly incorporated with the humours: tho' I was aware of the objection, that might ariſe from the experiments of injecting air into the veins, by which animals die with convulſions. For, all we can infer from hence is, that more air is thrown in than is conſiſtent with the circulation; and that if there was leſs, the animals might ſurvive, tho' perhaps not without ſome irregular motion of the blood, faintings, a palſy, or ſlighter affections of the nerves, according to the quantity of the air injected. Accordingly, we find ſome of the moſt accurate naturaliſts allowing upon trial, that air might be thrown into the veins (if in a ſmall quantity and inſenſibly) without killing the animal †. This fact is farther confirmed by all the experiments

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* Vid. loc: cit.

† Vena nempe jugularis vivi canis inflatur, protinus coagulatur ſanguis, et cita mors ſequitur liberum aëris per ſanguinem iter. Sed et pauco aēre injecto, neque necatis animalibus, pulſus intermittens fit. (Redi, Vol: VI. p. 223.)

riments made upon animals incloſed in an exhauſted receiver, which begin to ſwell all over, and to be thrown into convulſions as ſoon as the air is withdrawn; yet recover upon the timely readmiſſion of it *.

Have not, therefore, the ſymptoms of a deep ſcurvy ſome ſimilitude to what theſe animals ſuffer? For we are told, by thoſe who have had acceſs to ſee the worſt caſes, that intermiſſions and irregularities of the pulſe are amongſt the ſureſt diagnoſtics of the diſeaſe †; that the ſick are afflicted with vague and excruciating pains, coming on and going off ſuddenly, which are always rendered worſe by bleeding ||; that they have tumours appearing in ſeveral parts of the body, different from all others §; and that they are ſubject to ſudden and momentary numbneſſes of their limbs, to faintings and ſwoonings away upon the leaſt motion, and to convulſions and palſies of an uncommon kind ‡. To all which, let me add, the effects of the quick changes of the weight of the atmoſphere, which being more remarkable upon conſtitutions of this kind than upon any other, ſhould ſeem to confirm what has been conjectured, about the looſer connection of the air with the blood in ſcorbutic habits.

Laſtly, it may be proper to remove the difficulties of thoſe who maintain, that no animal can live whilſt the blood is really putrid; and therefore, that the moſt to be allowed, is only a tendency to putrefaction. But, to this we reply, that beſides numberleſs obſerva-

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Reſpondit dudum Bergerus, poſſe bullas magnas aëris frigore ſuo coagulare ſanguinem, et immeabilitate obſtruere vias, neque ideo aëris minimas particulas, ſenſim et parce admiſtas eadem mala facturas. Haller. *Not. in* Boerh. *Prælect. Phyſiolog. Vol.* II. *p.* 208.

* Boyle, Phyſico-mechan. Exp. and in the Phil. Tranſact. abrid. Vol. II. ch. i.—*Mem. de l'Acad. R. des Sc. A.* 1700, 1707.

† Eugalen. de Morb. Scorbut. Art. xi.

|| Id. ibid. Art. xii. et ſeq. Art. xxx.

§ Id. ibid. Art. xviii.

‡ Id. ibid. Art. xi. xxvi. xxvii.

tions of the corruption of all the ſecretions, as well as excretions in diſeaſes, we have frequent inſtances of the tawny colour of the *ſerum*, the *reſolution* of the *craſſamentum* and even of the offenſive ſmell of the blood recently drawn. And indeed, if we reflect how putreſcent blood is in a heat equal to that of the human body, we may be convinced, that no ſooner the perſpiration by the lungs and ſkin is impeded, (or whatever other outlet there may be for the volatile particles) than a corruption begins in the whole maſs; which if not timely prevented, muſt infallibly bring on a putrid diſeaſe *.

If the acrimony is great and ſudden, a fever or flux will enſue; but if the accumulation is ſo ſlow, that the body grows habituated to the putrefaction, a ſcurvy prevails. This is the caſe in long voyages, occaſioned by corrupted air and proviſions, on board unventilated ſhips; in marſhy countries, from ſimilar cauſes; and in a leſſer degree, in all northerly climates in moiſt ſituations, from a want of due perſpiration.

Now, theſe principles appear to be ſo plain, that it may ſeem ſtrange how they ſhould ever have been contradicted: and indeed, for this I can only aſſign the following reaſon. By ſome miſtake of the Chemiſts, putrefaction in animal ſubſtances was confounded with the idea of a highly acrimonious alcaline ſalt; which ſalt being looked upon as certainly deſtructive to the nerves; the concluſion was, that as no alcaline ſalts could, in that form, enter into the veſſels without tearing them to pieces, ſo the blood never could be ſuppoſed alcaline (or putrid) whilſt the perſon lived. But, from the experiments recited in the firſt of theſe Papers laid before the Society, we find that putrid ſubſtances are different from alcaline; and ſince the introduction of Mrs. Stevens's medicine, we ſee what immenſe doſes of very acrid ſalts may be ſwallowed without any harm. So different, therefore, are alcaline from putrid ſubſtances, that the former, of all ſtimulating medicines, are perhaps the leaſt hurtful to the nerves and blood-veſſels; whilſt every corrupted ſubſtance is not only offenſive to the external ſenſes, but to every nerve and fibre; as is evident from the *nauſea*, ſpaſms, palpitations, oppreſſion at the breaſt, dejection of ſpirits and other ſymptoms conſequent upon the admiſſion of any putrid *miaſma* into the blood.

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* It has been the opinion of ſeveral phyſiologiſts, that the blood was kept from putrefaction by its motion only; but for which they could aſſign no other reaſon than their obſerving the greater freſhneſs of running water, and of the ſea when agitated by the wind, in compariſon of the ſame when ſtagnating. But, here motion ſeems only to be the accidental cauſe, by furniſhing means to the water for exhaling its more corrupted particles; and in like manner the circulation of the blood can only enable it to throw off ſuch matter, as would corrupt it, if retained.

It will appear, that in all theſe Papers*, I have had only two *ſpecies* of the ſcurvy in view; *viz.* the *muriatic* and *putrid*; which are properly but one; ſince, ſalted meats have ſo great an effect in producing putrefaction. This was the opinon of Eugalenus, an author of the greateſt repute, as well as practice, in that diſtemper, and who lived in a country extremely ſubject to it. Since his time, among other *ſpecies* of that malady, one is ſuppoſed owing to an *acid*, a cauſe ſo oppoſite to the former, that tho' the ſymptoms were alike, it were to be wiſhed, to avoid confuſion, that this ſuppoſed *ſpecies* had been called by ſome other name. And the rather, as I apprehend, that in the countries moſt liable to ſcorbutic diſorders, an *acid* is ſo rarely to be blamed, that perhaps, we ſhould not have heard of it at all in this claſs of diſeaſes, had it not been for the celebrated virtues of the *raphanus ruſticanus*, *cochlearia*, and the like plants, in the cure. For, as all theſe came to be reputed of an alcaline or putrefying nature, an acid *ſpecies* of ſcurvy was perhaps fallen upon, to account for their operation. But, from the experiments laid before the Society §, theſe *ſimples* ſeem to have very different qualities from what ſome celebrated authors were naturally induced to believe, from their not being fermentable, nor yielding an *acid*, in the common way of making the experiment.

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* And likewiſe in the preceding OBSERVATIONS.

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§ Exper. xi. xx. xxxv. xxxvii. 5.

# *FINIS.*

## *ERRATA.*

Page 2, line 6, for *Graaf*, read *Grave*. p. 3, l. 3, for *lie*, r. *die*. p. 14, l. 5. for *Grammond*, r. *Grammont*. p. 15, l. 6, for *of one*, r. *of this one*. p. 52, l. 17. for *towards*, r. *to*. p. 60, l. 17, for *micaceous*, r. *marcaſite*: and eraſe the note at the bottom of the page; becauſe, ſince this ſheet was printed, I have ſeen in Mr. Da Coſta's collection of foſſils, certain ſtones ranged by that curious gentleman under the claſs of marcaſites, to which, thoſe I ſaw on the beach of Loch-Neſs bore a nearer reſemblance than to the micaceous kind. p. 61, l. 22. dele *bilious*. p. 157. l. 9. for *firſt*, r. *firſt*, and add, *mentioned by the learned Profeſſor Boerhaave, and introduced, &c.* p. 253, l. 1, for *Chammæl.* r. *Chamæmel.* p. 318, l. 2 of the note, a drachm is marked in two editions, that I looked at, of the original, yet I doubt it is a miſtake in the printer, for a ſcruple: but I would not alter it. p. 364, l. 3 of the note, for *and*, r. *or*. p. 378, l. 12. for *there ſinous*, r. *the reſinous*. p. 397, l. 14, for *raddiſh*, r. *radiſh*. p. 389, l. 22, make the ſame correction.